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HOUSING INDETERMINACY: Responsive Design for Diverse and Changing Households

Mark Sousa
Syracuse University

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HOUSING INDETERMINACY:

Responsive Design for Diverse and Changing Households

Mark Sousa

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Secondary Adviser | Liz Kamell

SYRACUSE UNIVERSITY SCHOOL OF ARCHITECTURE
Submitted November 29, 2012

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CONTENTION

EXISTING housing stock is no longer capable of properly accommodating today's population.¹ In many cities across the United States, housing reflects the outdated ideals and demographics of the early to mid-20th century. Organizational rigidity and spatial specificity has hindered the ability of these dwellings to adapt to different conditions, leading to a lack of maintenance and, in some cases, obsolescence. This mismatch between housing and household type forces occupants to live in spaces unsuitable to their needs in homes that may be inefficient, unaffordable or lacking an organization relevant to the particular group of inhabitants it houses. The nation is faced with a housing crisis resulting from the proliferation of the detached suburban home—an inherently unsustainable typology rooted in the ideals of the American Dream. The predominance of the traditional patriarchal family is quickly declining as a result of increased female independence, divorce, smaller household sizes and an aging population. Contemporary lifestyles often lead to the division of traditional families, an increase in geographic movement and a change in living patterns.²

In order to accommodate a diverse and rapidly changing household type, housing must be of a responsive nature and capable of adapting to the different needs of today's population and the unknown needs of the future. This necessitates an acknowledgment of the increase in non-traditional households, ie. single-headed families, single women, elderly couples, etc. In this context, responsive architecture can be defined as the ability of a building to adapt and respond to the needs of its occupants ie. income, household size, urban attitude. This may be achieved through adaptable design. Adaptable buildings are not necessarily, or solely, comprised of 'moving parts,' but also layouts or systems that allow for future programmatic changes (the unknown). Along with the ability to house different socio-economic groups, adaptable architecture also has financial and sustainability benefits for occupants and developers.³ Modularity is an important aspect of adaptability because of its capacity to use generic, systematic design to achieve specific solutions.

Housing is innately generic in that it is a universal necessity that responds to basic human needs common to everyone. Similarly, rapid change in housing demographics is also a universal issue. In this sense, the design of responsive housing may involve a widely applicable system of modularity. This may allow design solutions advanced by this thesis to be relevant at the scale of the housing crisis. However, all generic solutions require specificity to site in order to test how or whether the housing relates to local context. This project will use Syracuse, New York as a testing ground for flexible, high-density housing. While the use of Syracuse as a site is relatively arbitrary, it will serve to provide design constraints, thus legitimizing the project as a possible real-world solution. The selection of Syracuse as a specific site for this design project also demands that attention be paid not only to physical site characteristics, regional climate, and local culture, but also to local planning and zoning policies.

Previous research and precedents provide a strong foundation for the testing of this contention. Using flexibility for architectural housing design as an innovative method to solve the housing crisis is an idea that has been in existence for at least the last century. The Modern architect's fascination with technology and mass-production led to a vast number of experimental housing projects in the early 20th century. Le Corbusier, Walter Gropius, Buckminster Fuller and many more all produced inventive designs. The latter half of the century marked another surge of interest, both in flexible designs for slum or disaster relief housing as well as adaptability for small, economic homes for a rapidly urbanizing world.³ Past designs have led to innovative and sometimes beautiful housing solutions, but rarely used the power of adaptability to house a diverse group of residents in a single project. I will critically analyze the successes and failures of built works and develop sets of requirements—both spatial and programmatic—for the project in Syracuse. Precedents will be studied for their attitudes toward affordability and efficiency, adaptability and urban character. Infill Housing by Koning Eizenberg, the Water Villas by UN Studio, Uberbauung Hellmutstrasse by ADP Architektur and House 194X by SOM will all be analyzed.

This claim can initially be tested through research of the challenges associated with mixed-household developments, specifically the design challenges. By carefully analyzing the needs of the specific socio-economic groups in Syracuse, it will be possible to determine the wide range of living requirements necessary for the proposed housing project. There is a wealth of knowledge concerning the architectural manifestation of social theories and ideas. This works hand-in-hand with a study of changing household types in the United States. Observing and analyzing past trends and the degree to which past housing has responded to evolving demands is critical to understanding the status quo and future trends.

Great attention must also be paid to the current land use/zoning restrictions, government policies and social norms of the city of Syracuse. These are external, large-scale planning factors that should be considered by architects with aspirations of social change seeking to positively affect neighborhoods and communities. By accessing the wealth of information available to Syracuse University concerning the city's urban dynamics, and having easy access to the proposed site, it will be possible to determine how a responsive housing project may work within the city. Current policies must also be put into context with major historical causes. This can be achieved by researching the urban history of the American city in relationship to housing policy and other public policy shifts.

The final project phase will consist of a design project for mixed-household, responsive (affordable, efficient, adaptable, contextual) housing in Syracuse, New York. The aim of this design is to prove that an architectural intervention informed by my research can house multiple types of occu-

pants simultaneously and allow for future adaptability. Architectural diagrams, drawings and renderings will indicate whether an intervention of this kind can be successful in this specific context, and whether the proposed generic design solutions can be implemented at a wider scale. This project should contribute to the existing rhetoric and body of work associated with architecture's continuous desire to improve living spaces through the built environment.

This project hopes to create a new outlook on the future of housing design. Ray Forrest wrote, "The pace of demographic change need not be that dynamic to outpace the capacity of markets or states to provide appropriate dwellings in appropriate locations. [...] Dwelling placement or adaptation is always likely to lag."² The preceding statement reflects the belief that housing is static and rigid, and that dwelling replacement or major structural adaptation is necessary to accommodate a continually evolving population. On the contrary, **responsive housing can release significant pressure on housing systems by anticipating change and providing a lower cost alternative. The development of mixed-household dwellings leads to increased socio-economic diversity, thus increasing the potential for healthy, vibrant communities.**²

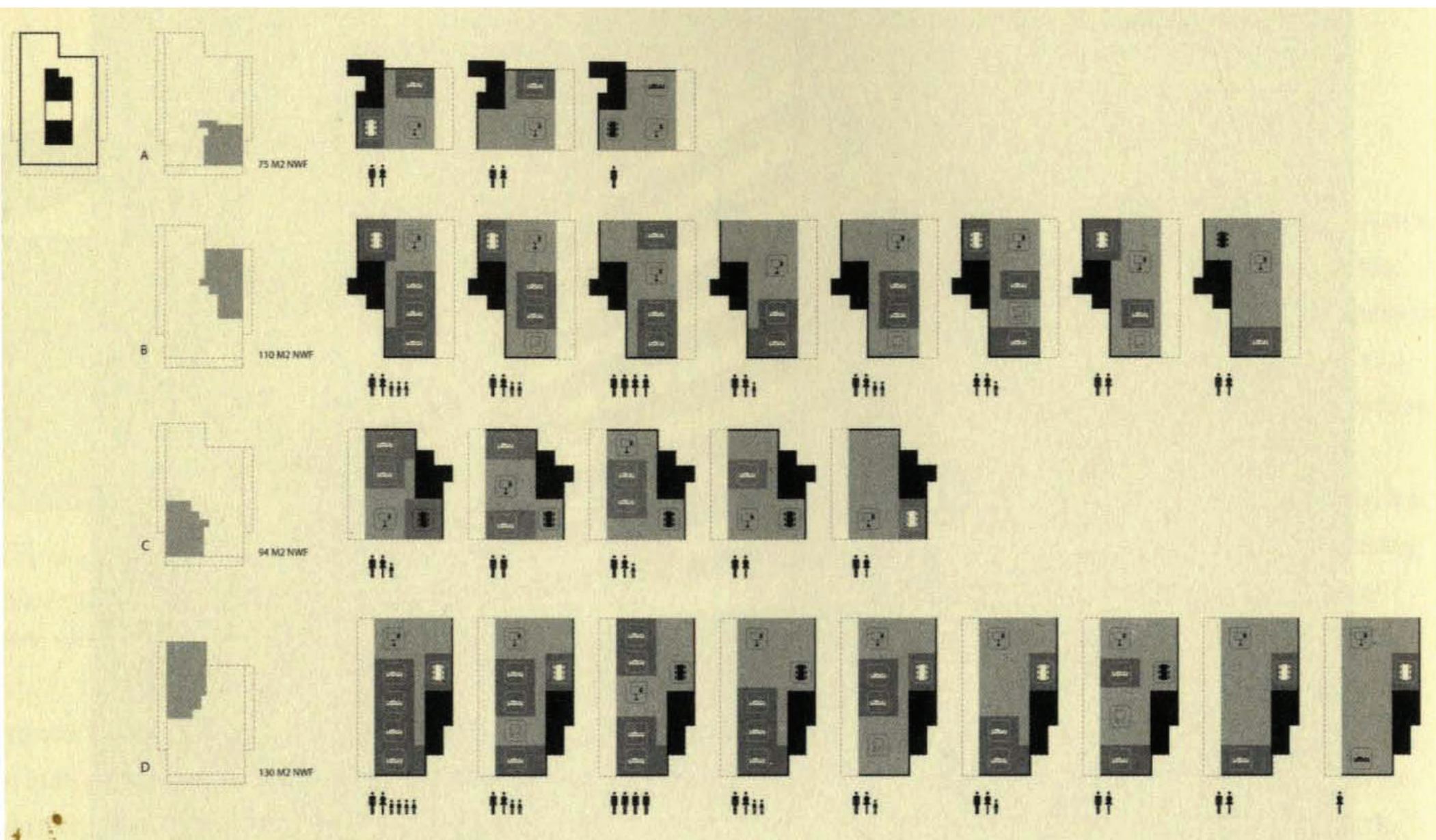
1. STEINFELD, Edward. Inclusive Housing: A Pattern Book: Design for Diversity and Equality. New York: W.W. Norton and Co., 2010.

2. FORREST, Ray and James Lee. Housing and Social Change: East-West Perspective. London: Routledge, 2003.

3. SCHNEIDER, Tatjana and Jeremy Till. Flexible Housing. Oxford: Architectural Press, 2007.

4. TILL, Jeremy. "Flexible Housing: The Means to the End." Architectural Research Quarterly 9, no. 3/4 (2005): 287-296. Accessed September 26, 2012.
http://www.jeremytill.net/Article_files/flexible_arq_2.pdf.

Fig. 1
EM2N ARCHITECT
*Siedlung Hegianwandweg - Plan with
25 different scenarios, 2003*
Pg. 146, *Flexible Housing*, 1st edition
Oxford: Architectural Press, 2007



CHANGING DEMOGRAPHICS

+

UNRESPONSIVE HOUSING STOCK

(inefficient, unaffordable, unadaptable,
contextually inappropriate)

**CRITIQUE OF TRADITIONAL
DETACHED HOME / SUBURBIA**

**STUDY OF CHANGING HOUSE-
HOLD MAKEUPS**

**WHAT MAKES HOUSING AFFORDABLE,
EFFICIENT, ADAPTABLE?**

**CONTEXTUALIZE RESPONSIVE HOUSING
IN DANFORTH NEIGHBORHOOD**

RESPONSIVE HOUSING



AFFORDABILITY
EFFICIENCY
ADAPTABILITY
CONTEXT

Addition / Subtraction
Modularity
Core and Systems
Transformable Partitions
Neutral Functionality
Excess Space

Minimize Stairs
Accessibility for Disabled
Private Access to Ground Floor
Children-friendly Design
Location - Access to Services

Space Reduction
Ceiling Height Reduction
Neutral, Multi-functionality
Square Layouts
Fewer Walls - ext., int.
Wood Frame Construction
Standard Size Framing/Structure
Modularity

Building Scale
Density
Setbacks / Lots
Urban Attitude
Cultural Appropriateness

A poorly maintained Danforth
neighborhood home serving as an
example of deficient, unaffordable,
inflexible housing



AMERICAN HOUSING POLICY

“There is an allusion of happiness associated with traditional ways of living.” - Krokfors



HISTORY OF AMERICAN HOUSING REGULATION

The issue of housing policy first arrived during the 1930s in response to a lack of government regulation of housing. Conditions in many urban areas across the United States were appalling during the nineteenth century. New York City was the quintessential example of a city in desperate need of housing regulation. Initially, policy centered around redevelopment--typically slum clearance (Plunz). Public housing projects also rose to prominence after the 1930s. By the 1950s, the public came to associate government housing projects with the large, superblock towers conceived by Le Corbusier. Projects like Pruitt-Igoe in St. Louis became icons of modern housing (especially after Pruitt-Igoe's demolition in the mid-1970s).

The proliferation of the American suburban home can be linked directly to housing policy. As early as the New Deal of 1940-42, the U.S. government was subsidizing middle-class housing. This increased the appeal of the 'garden city' or suburban neighborhood. The Housing Act of 1949 was a landmark expansion of the federal government's role in housing finance. It had serious effects on mortgage payments and was partially responsible for the proliferation of post-war suburbs. Large mass-produced suburbs like Levittown, New York became possible because of housing industrialization and the transformative effect of the automobile. The Federal Aid Highway Act of 1956, signed into law by Dwight Eisenhower, led to the construction of the interstate highway system and thus further contributed to an increase in suburban development.

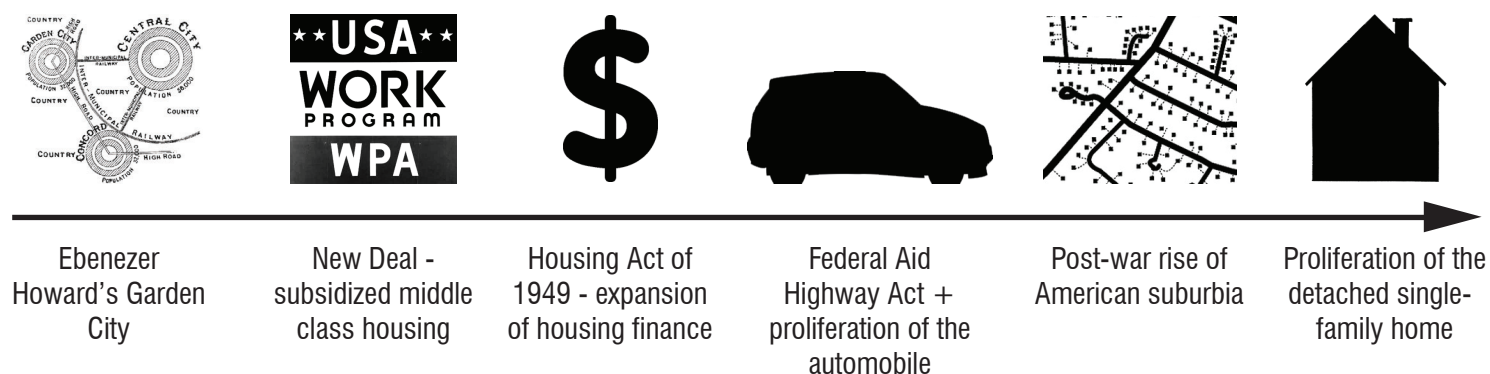


Fig. 2
Levittown - Aerial View 6.
 1947
 Levittowners.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

In 1965, the Department of Housing and Urban Development was upgraded to cabinet-level within the U.S. government. The department is responsible for numerous landmark acts that have shaped American housing up to today. Most recently, HUD has placed renewed emphasis on social concerns and inclusivity. Adams has written “as a weapon of social exclusion, housing normally works extremely well” (Fraser and Nelson). Since the 1990s on, mixed-income developments have largely been seen as the solution to the growing concern of social exclusion. As a response, HUD formed the HOPE IV program in 1992, made into a law in 1998. HOPE IV aimed to revitalize some of the worst public housing projects by converting them into mixed-use developments (MIDs) or demolishing them and building anew. New construction focused on smaller scale buildings because large apartments were “believed to be unhealthy for human occupation” (Fraser and Nelson).

The HOPE IV program received strong support for the following reasons: a promise to “reduce social problems related to concentrated poverty,” addressment of severely distressed housing units, positive influence on cities and the “creation of an environment that allows other poverty amelioration strategies to be successful” (Fraser and Nelson). The success of HOPE IV initiatives largely relied on the convenience / attractiveness of a site, good management of the differing needs between the public and private sectors and a critical mass of higher income residents (Fraser and Nelson). It was discovered that MIDs had positive outcomes when they:

- 1) created and solidified social networks
- 2) introduced behavioral modeling
- 3) created a form of social control
- 4) enhanced the political economy of the community

Conclusively, recent HUD programs have highlighted a need for community and social service programs, resident participation and client inclusion in the decision making process. The most difficult obstacle to overcome during redevelopment is the avoidance of displacing existing residents.



CONTEMPORARY HOUSING AND SOCIAL THEORY

Contemporary housing and social theorists generally agree that a rapid change in demographics has placed serious strain on housing markets (Lee and Forrest). Some of the **most pressing social issues associated with housing include:**

- 1) Sustainable development**
- 2) Social exclusion and inequality**
- 3) Economic instability**
- 4) Diversity and social fragmentation**
- 5) Constantly changing role of state involvement (Forrest)**

Increasingly diverse households are often blamed on “economic migrants,” or people who are willing to move or break apart from their family in order to find adequate work (Forrest). These economic migrants are a manifestation of a rapidly globalizing world. Interestingly, an increased interconnectedness between nations / corporations has led to an increased disconnectedness between households.

The decline of the traditional patriarchal family is very apparent. Its causes include:

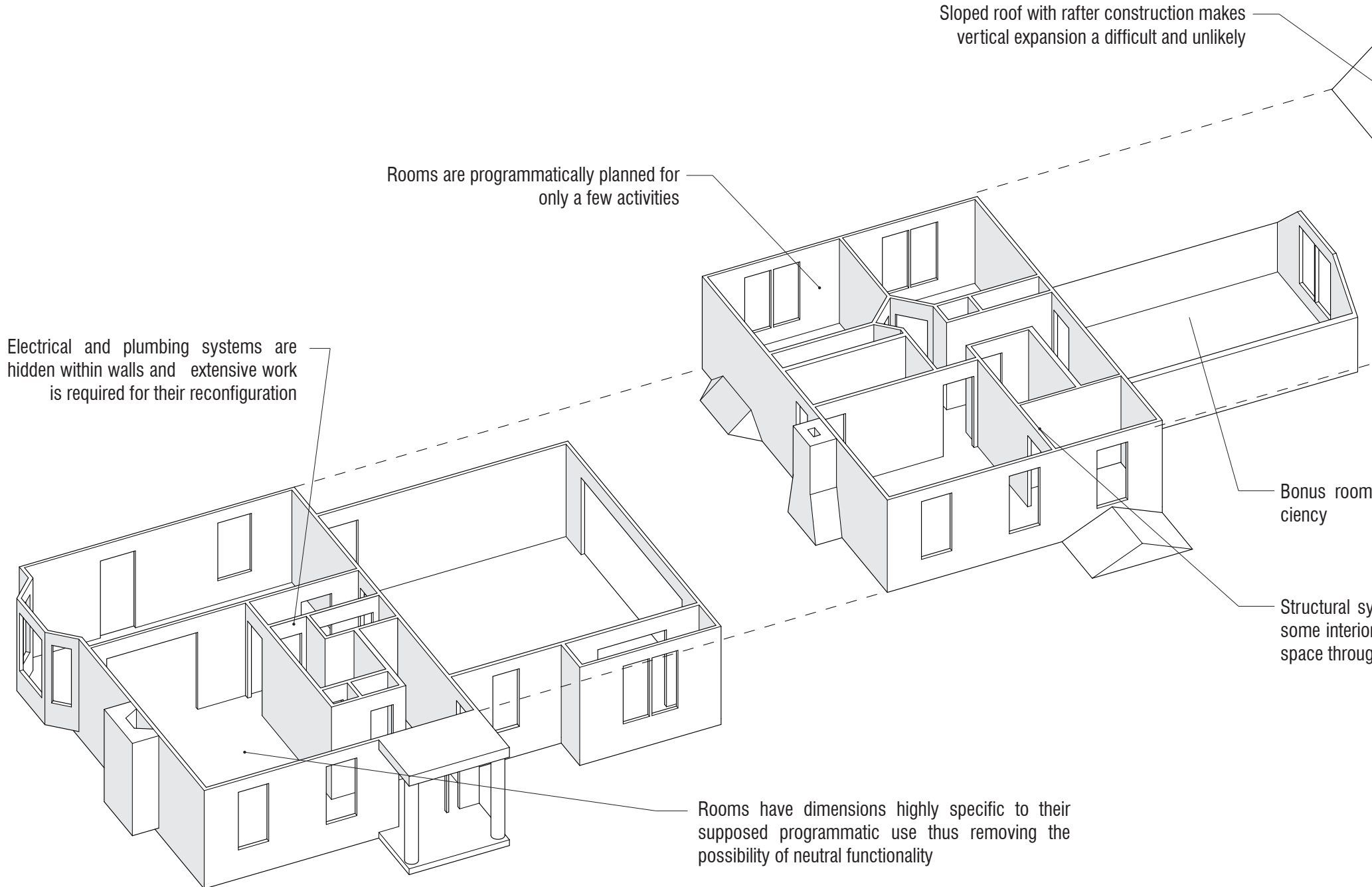
- 1) Increase in female independence**
- 2) Rapid aging of population**
- 3) Increase in divorce**
- 4) Decrease in the power of state and religion (Forrest)**

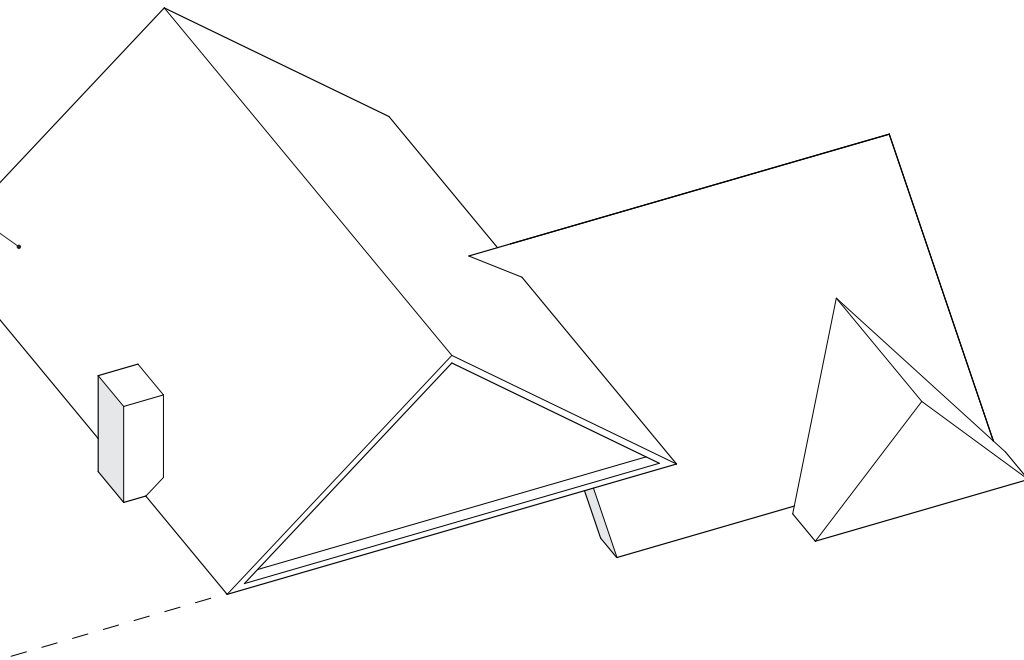
Single households are on the rise largely because:

- 1) People live alone for longer**
- 2) Increase in relationship breakdowns**
- 3) Increase in life expectancy (Forrest)**

Women have been particularly affected by these trends. Part of the solution to these changes in demographics lies in the adoption of a multiculturalist approach to policies. There must be a greater involvement of minority groups in regenerative housing projects.

THE TRADITIONAL AMERICAN HOME INADAPTABILITY





Auburn Chase is a detached single-family model home designed by Fox Fun Plans. It is available in central New York for an estimated \$140,000. Features of the home include 3 bedrooms, 2.5 bathrooms and 1,568 sf. Its plan features a typical, rigidly designed spatial layout with a formal living and dining room, master bedroom, walk-in closets, brick fireplace, front porch and two car garage. Its design is entirely determined by market and consumer demand. Its target household type is the nuclear family and its design demands a suburban context.

This home is an impractical and inappropriate dwelling type for the Danforth neighborhood of Syracuse. The estimated \$140,000 listing price is well above the budget of Danforth residents whose household income averages \$37,780. Danforth's unemployment rate sits at 20% and the percentage of people living in poverty is 44.8% (US Census Data). In terms of household makeup, 78% of dwellings house families but only 24% of those families feature a nuclear makeup. Female-headed families and single householders comprise a significant portion of the neighborhoods population. *Auburn Chase* would be oversized and overpriced and its target demographic fails to match with that of the neighborhood.

epitomizes excess space and ineffi-

system is linked with exterior walls and
r walls making it difficult to reconfigure
h wall movement or removal

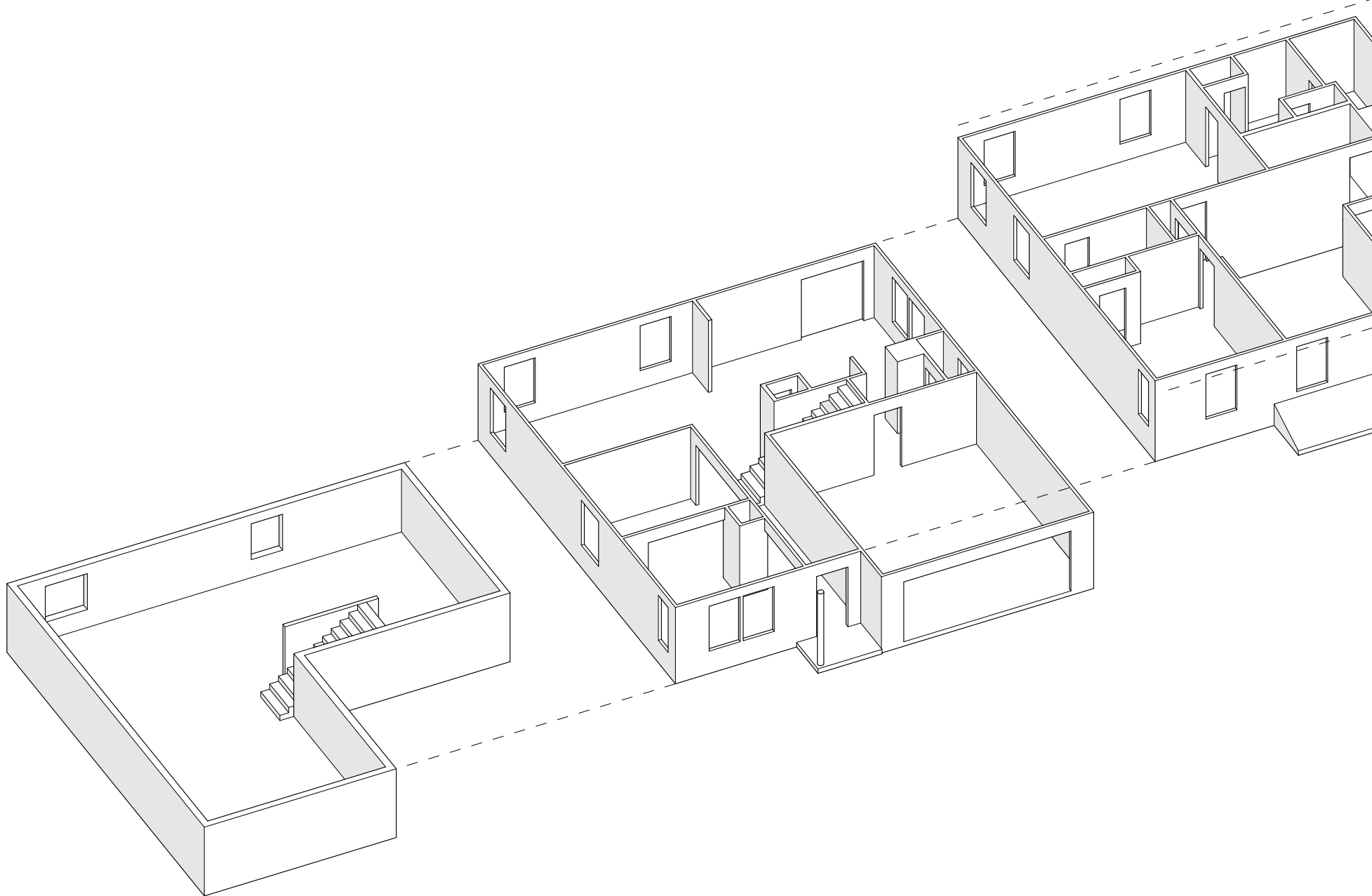


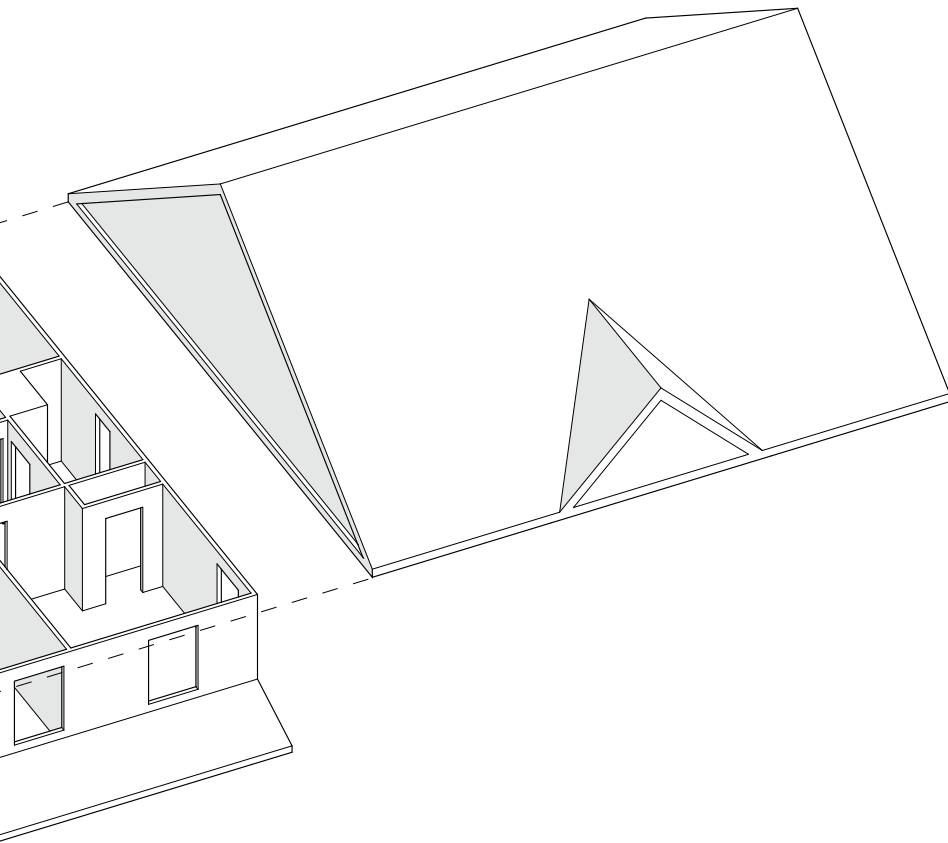
“AUBURN CHASE”

(Plan Source: Fox House Plans

<<http://www.foxhouseplans.com/details.php?prodId=31&category=16>>)

THE TRADITIONAL AMERICAN HOME
EFFICIENCY AND AFFORDABILITY





The Milan is a detached single-family model home designed by Ryan Homes. It is available in central New York for an estimated \$190,000. Features of the home include 4 bedrooms, 2 bathrooms, 2,528 sf and 100% energy star certification. Its plan features a typical, rigidly designed spatial layout with a formal living and dining room, open kitchen with breakfast bar, walk-in closets and two car garage. Its design is entirely determined by market and consumer demand. Its target household type is the nuclear family and its design demands a suburban context.

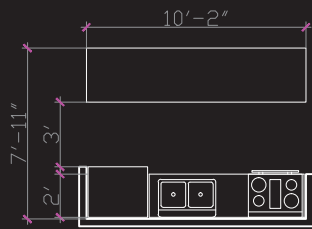
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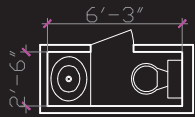
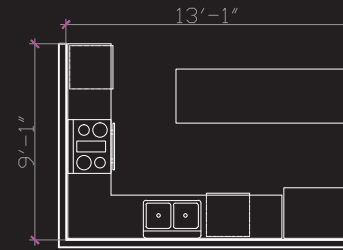
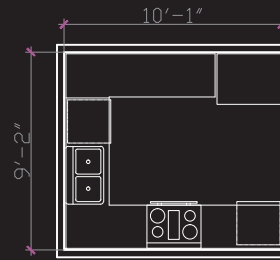
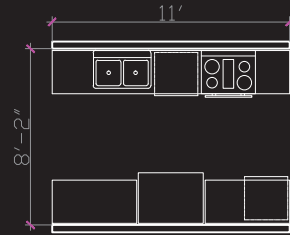
"THE MILAN"

(Plan Source: Ryan Homes

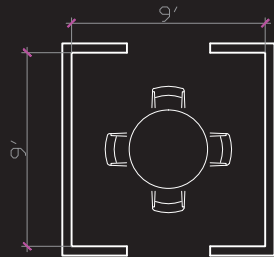
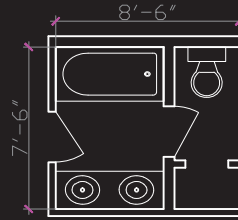
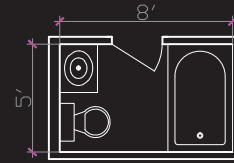
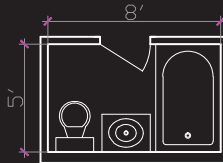
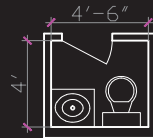
<<http://www.ryanhomes.com/find-your-home/our-homes/single-family/milan/mln00>>)



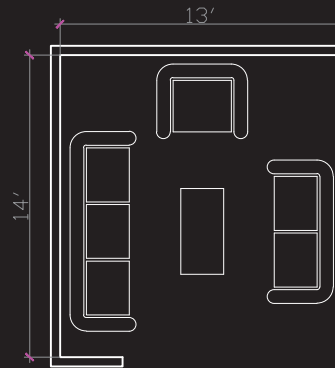
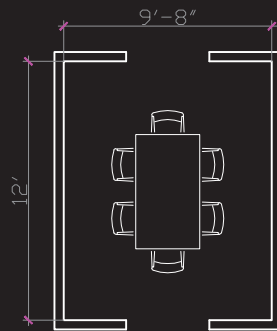
Kitchen



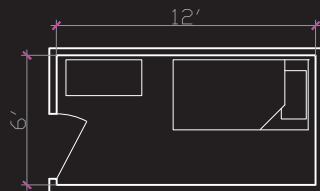
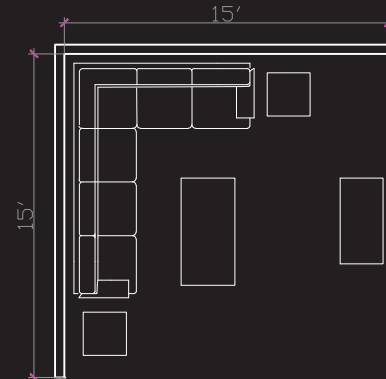
Bathroom



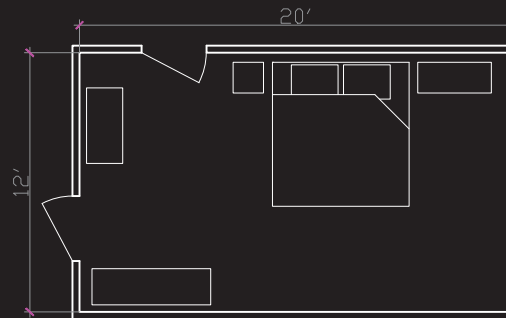
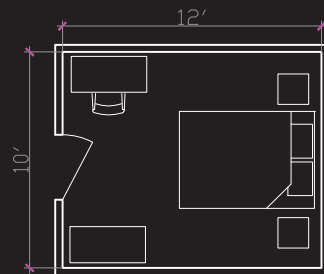
Dining



Living



Bedroom



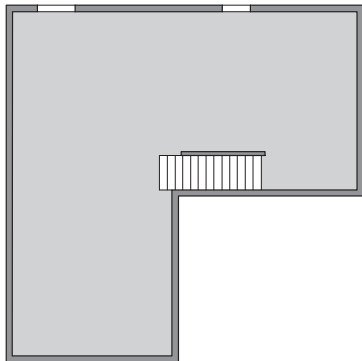
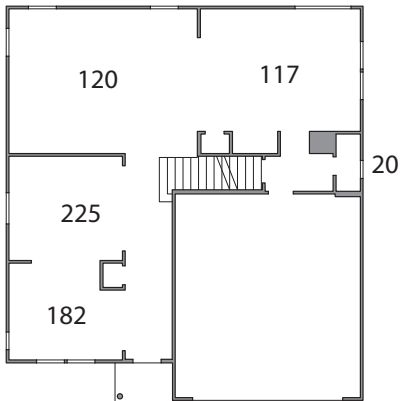
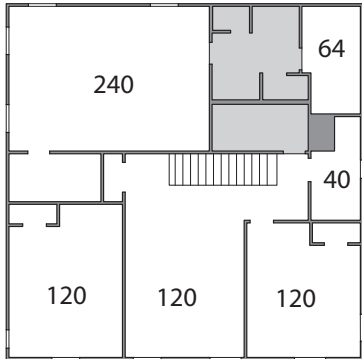
This 'kit of parts' represents efficient room sizes for a standard home program. To the right, two traditional homes are resized based on this kit of parts. This emphasizes the drastic inefficiency of the typical suburban home.



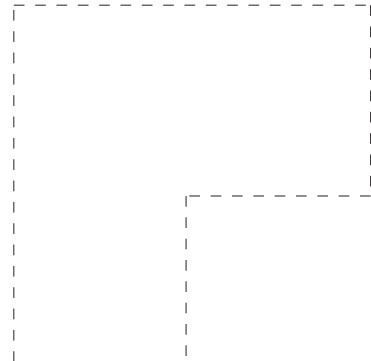
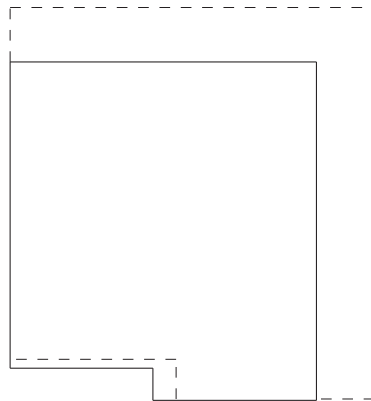
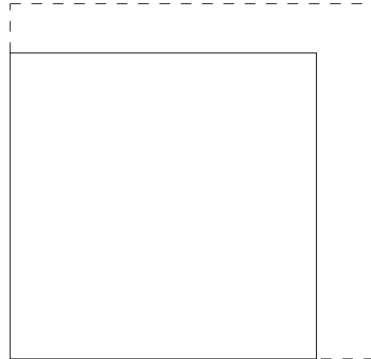
Efficient sf. = 1,368
 +137 (10% circ.)
 +137 (10% storage)

Total efficient sf. = 1,645
 Actual sf. = 2,528
 Surplus = 883

Actual Floor Plans



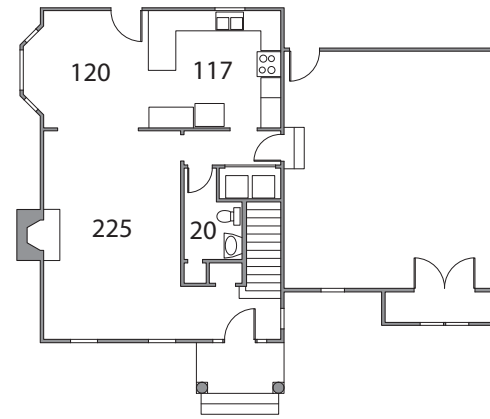
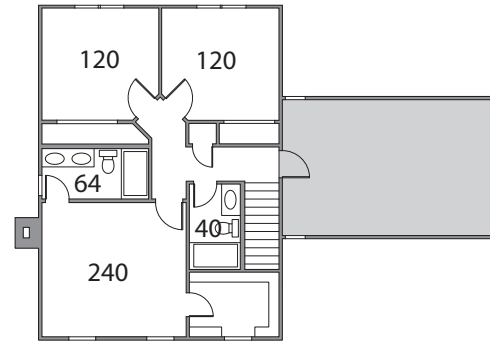
Efficient Floor Plans



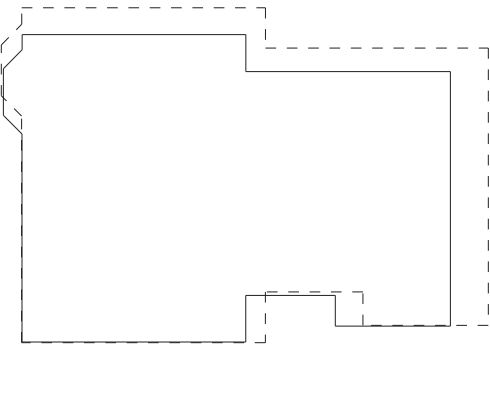
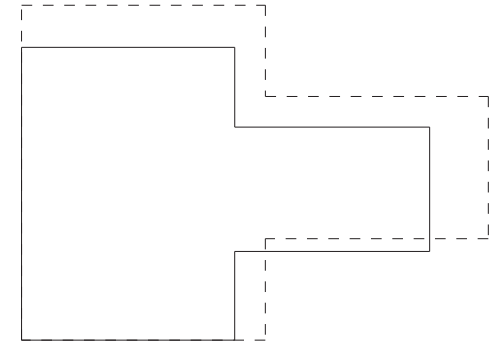
Efficient sf. = 1,066
 +107 (10% circ.)
 +107 (10% storage)

Total efficient sf. = 1,280
 Actual sf. = 1,568
 Surplus = 288

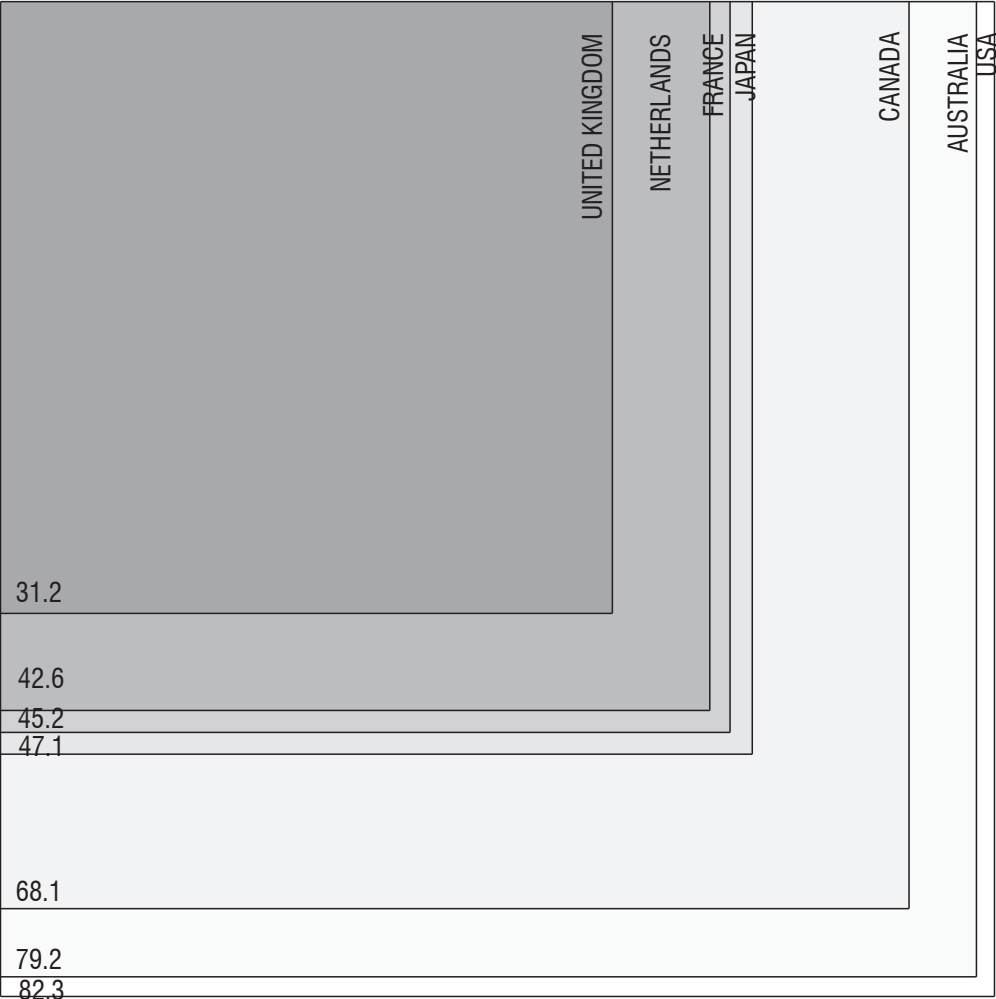
Actual Floor Plans



Efficient Floor Plans



WORLD HOUSING DATA



AVERAGE HOUSE SIZE (per person)(m2)

A HISTORY OF ADAPTABLE HOUSING

“Versatile is the house: just like men, flexible yet solid.” - Bruno Taut

1929: Second CIAM Congress in Frankfurt pushes for a reduction in living space through efficiency and flexibility

1927: Completion of Wiessenhofsiedlung in Stuttgart featured new efficient housing designs, some with flexible elements, particularly Mies Van der Rohe's block.

1914-1922: Le Corbusier designs a series of mass-produced housing including Maison Domino, Maison Voisin and Maison Citrohan

1940s (early): Increase in popularity of industrialized housing in the United States

1942: 'The New House 194X' featured flexible housing designs by several prominent architects in an issue of Architectural Forum.

1969: Giancarlo de Carlo's experiment for user-need based housing in a lecture "Architecture's Responsibility" brings awareness to the implications imposed by the user

1960s(late): A growing interest in housing schemes show an interest in user involvement and participatory design, known as democratization of housing and democratization of the design process

1961: John Habraken's semi-detached houses in Rotterdam support an alternative to mass housing, revolutionizing flexible design by separating the structure from the construction

WORLD WAR I

1920

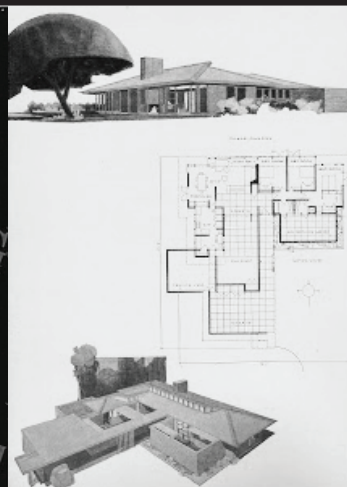
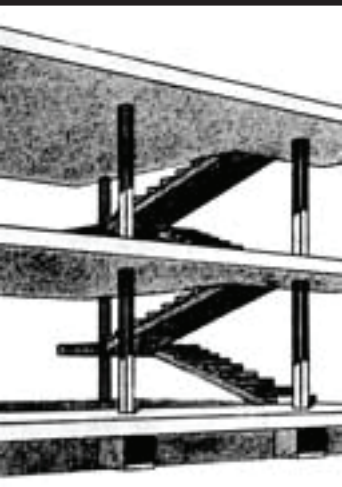
1930

1940

WORLD WAR II

1950

1960



makes an argu-
d design in his
People.” This
idea of transfor-
ser post-design.

g number of
in user empow-
design. This was
and decentral-
ss

iminal text “Sup-
mass housing”
sign by empha-
elements in

1960

1970

1980

1990

2000

1970s: Revitalized interest in modular design still continues to the present day particularly in European nations like Germany, the Netherlands and Spain.

1990s: A significant amount of attention is drawn toward disaster relief housing. This typology inherently calls for a system of modularity and is often quite flexible and innovative.

NGERS

et einde

van de



THE MODERN ERA

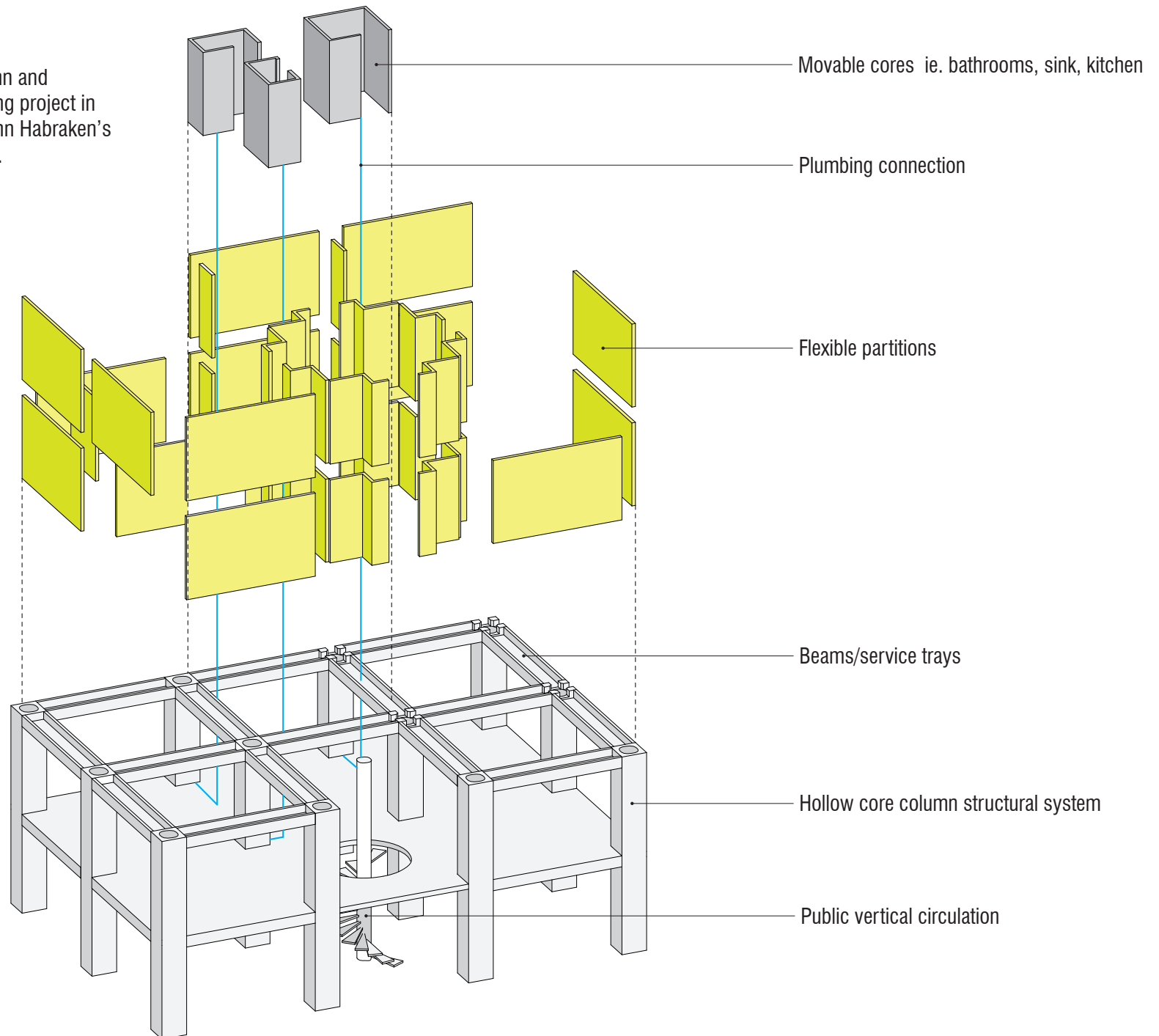
The turn of the twentieth century and the introduction of modern architecture placed new values at the forefront of architecture. There was a revived interest in social involvement and human comfort. Demands of modern life led to increased spatial movement of people and a smaller household size. People were constantly migrating--part of an ever-changing, rapidly industrializing world. Architects sought to respond to these new human conditions by allowing occupants to have more control over their built environment--particularly in the home. Le Corbusier, Walter Gropius and Buckminster Fuller all attempted to use new design theories and technologies to design for rapidly evolving households. Examples of built works with an interest in adaptability include Weissenhofsiedlung in Germany and Corbusier's mass-produced housing including the Maison Voisin and Maison Citrohan.

The second World War only heightened the architect's interest in designing for change (Schneider). Mass-produced, industrialized housing became more prominent in the United States. In 1942, the "New House 194X" competition called for the involvement of numerous renowned architects in the design for revolutionary housing. Many of the entries, including SOM's house, featured adaptability as the primary design solution. Modular design was now a possibility and its potential was beginning to be tapped.

The 1960s were a time of great social change in the Western World and ideas of empowerment and democracy permeated the field of architecture. A growing number of housing projects and competitions showed an interest in participatory design. This process placed emphasis on the client and users rather than the architect. In most cases, a client's preferences would have a direct influence in the design process (Schneider). While user participation does not necessarily involve flexible design, many architects chose to incorporate flexible spaces and elements into their work. In 1969, John Habraken revolutionized adaptable design through his publication "Supports: an alternative to mass housing" by arguing for the separation of elements in construction. This shifted mass-production's focus from the home as a combination of spaces to the home as a combination of mass-produced systems ie. wood frame structure, plumbing, etc.

Today's most innovative adaptable housing projects can be seen in the numerous designs for disaster relief housing and temporary shelter. These structures are inherently flexible because they are required to adapt to unknown and changing conditions (Schneider). Prior to a disaster, it is not known what types of people and families will be in need. Thus, these temporary shelters are important examples of contemporary flexibility.

Exploded axonometric of Kohn and
Maurios' Les Marelles housing project in
France (1975) illustrating John Habraken's
new theory of flexible design.



GRAMMAR

FUNCTIONAL RELATION OF VOCABULARY

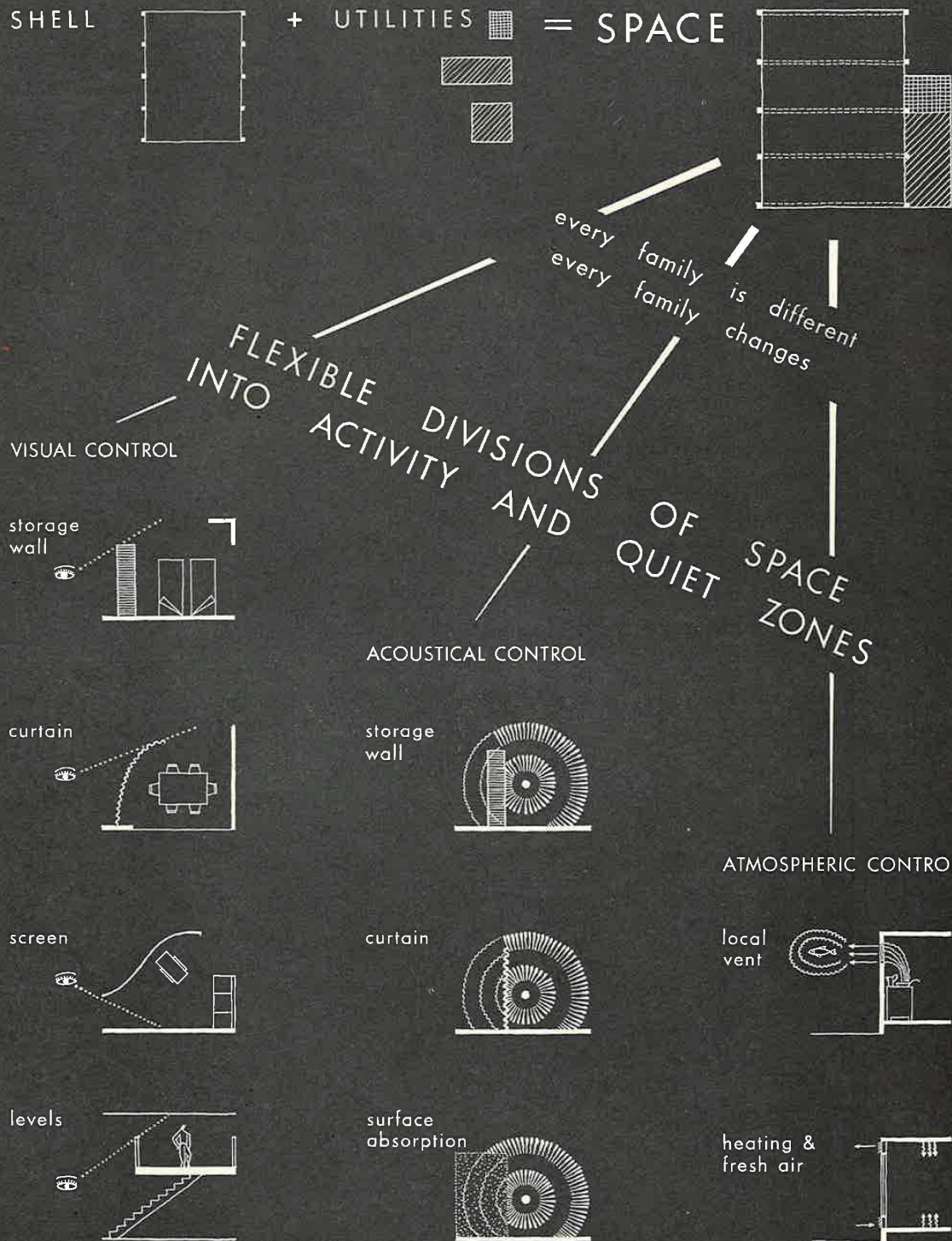


Fig. x

"Grammar" - *The New House 194X*
Skidmore, Owings and Merrill.

1942

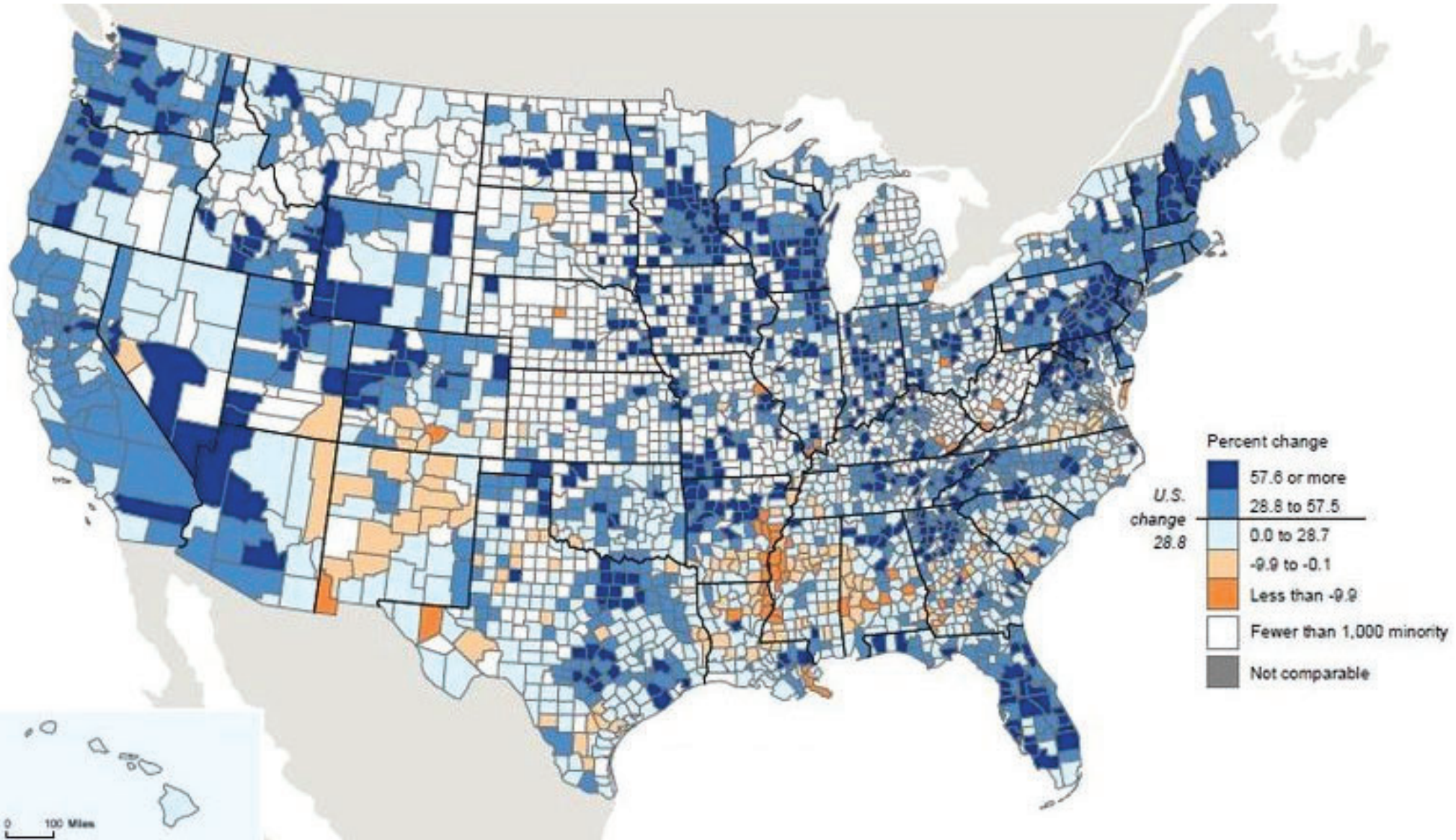
pg. 108, "The New House 194X." *The Architecture Forum*.
September 1942

EVOLVING DEMOGRAPHICS, HOUSEHOLD TYPES

“Housing professionals must make a concerted effort to investigate the needs and resources of a much more diverse household population if they wish to take advantage of, rather than suffer from changes in, the demographic context.”

- Martha Farnsworth Riche

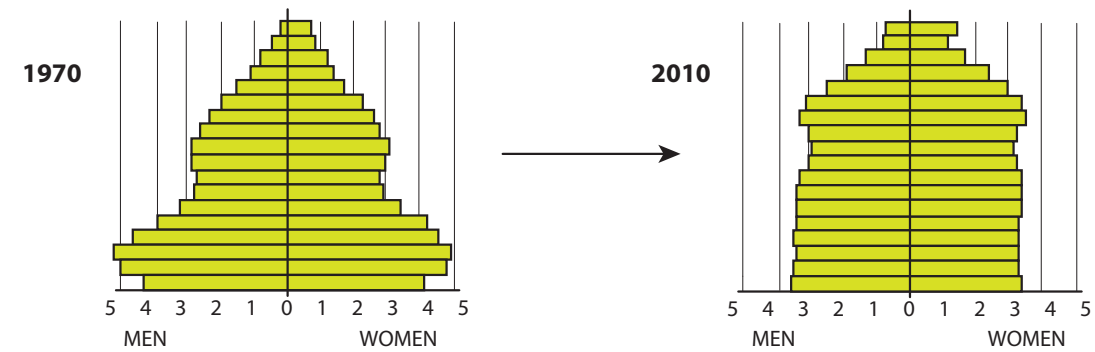
Percent Change of Minority Population



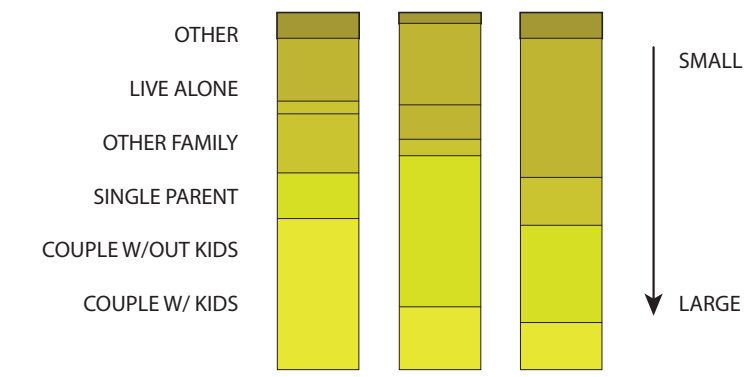
(Map and Source Data: US Census Bureau <<http://blogs.census.gov/2011/03/24/race-and-hispanic-origin-and-the-2010-census/>>)

FUNDAMENTAL SHIFTS IN U.S. DEMOGRAPHICS:

1. Increase in the Middle-aged and Elderly



2. Shrinking Household Size

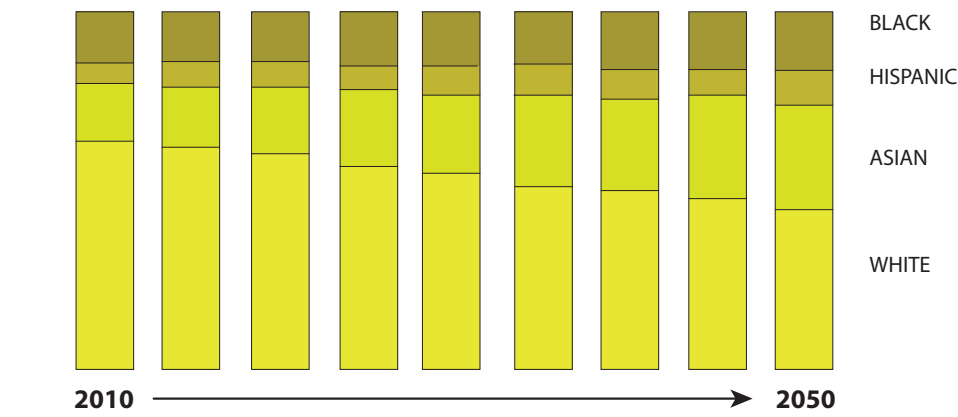


RESULTING AFFECTS ON HOUSEHOLD

Increase in female independence
Increase in elderly homes
Increase in single parents

Decrease in average household size
Decrease in nuclear family

3. Increase in Minorities and Non-traditional Households



NATIONAL TRENDS

Changes in demographics and household structure will reshape housing demands in the twenty-first century. In the past, trends in demographics have largely been ignored by housing professionals when it comes to design and policy. Martha Farnsworth Riche outlines the argument for stronger attention paid toward these trends. She argues there are three shifts in U.S. demographics that will have a significant impact on housing needs:

- 1) Increase in middle-aged and elderly**
- 2) Shrinking household size**
- 3) Increase in minorities and non-traditional households (Farnsworth)**

While these are very common trends throughout the nation, they are not necessarily occurring everywhere. Areas that are most likely to see these changes are those that are urban. Rural counties may in fact see the opposite. Nevertheless, on average, the changes require significant changes in design methods. Syracuse, as an urban area, is a strong example. In conclusion, Farnsworth offers advice to housing professionals on how to deal with changing population:

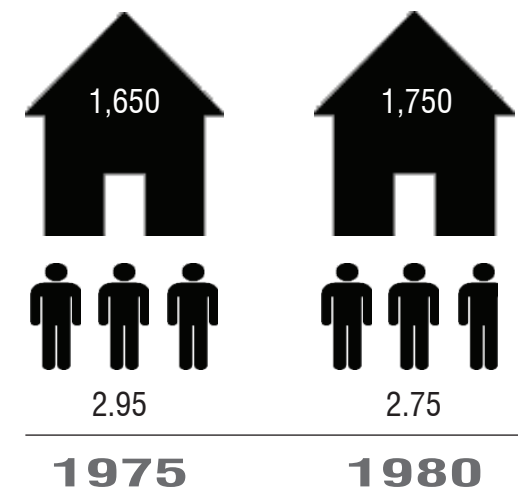
1) “Discover what growing household segments really want from housing” (Farnsworth Riche 144). Along with demographics, housing preferences are changing as well. It is imperative to pay attention to the desires of these increasing populations. For example, post-child families will have different values than those still raising children.

2) “Investigate household composition for each minority group.” Designers of the past largely ignored the housing requirements and/or preferences of these groups simply because they were not significant. White nuclear families were the predominant households of the past, but today’s minority families are mostly comprised of extended families or disconnected families ie. single-women headed households (Farnsworth Riche 144).

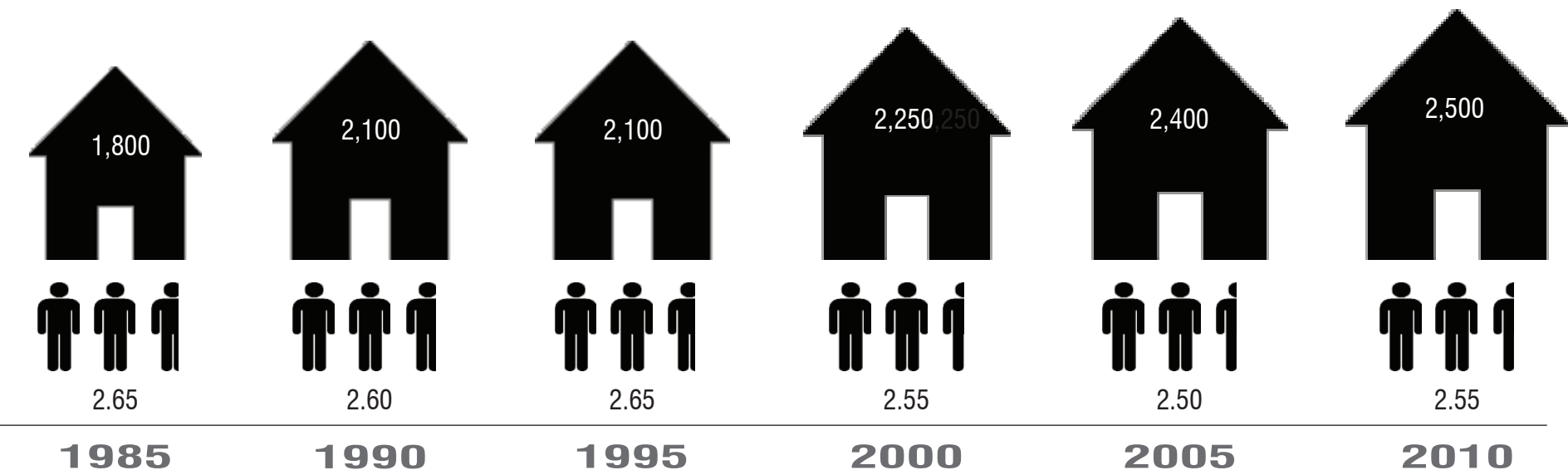
3) “Develop an understanding of the relationship between household income and household composition.” Traditional families typically have higher incomes and therefore different needs than, for example, single-headed female households. (Farnsworth Riche 145). It is important to recognize these distinctions.

Shrinking Household Size VS.

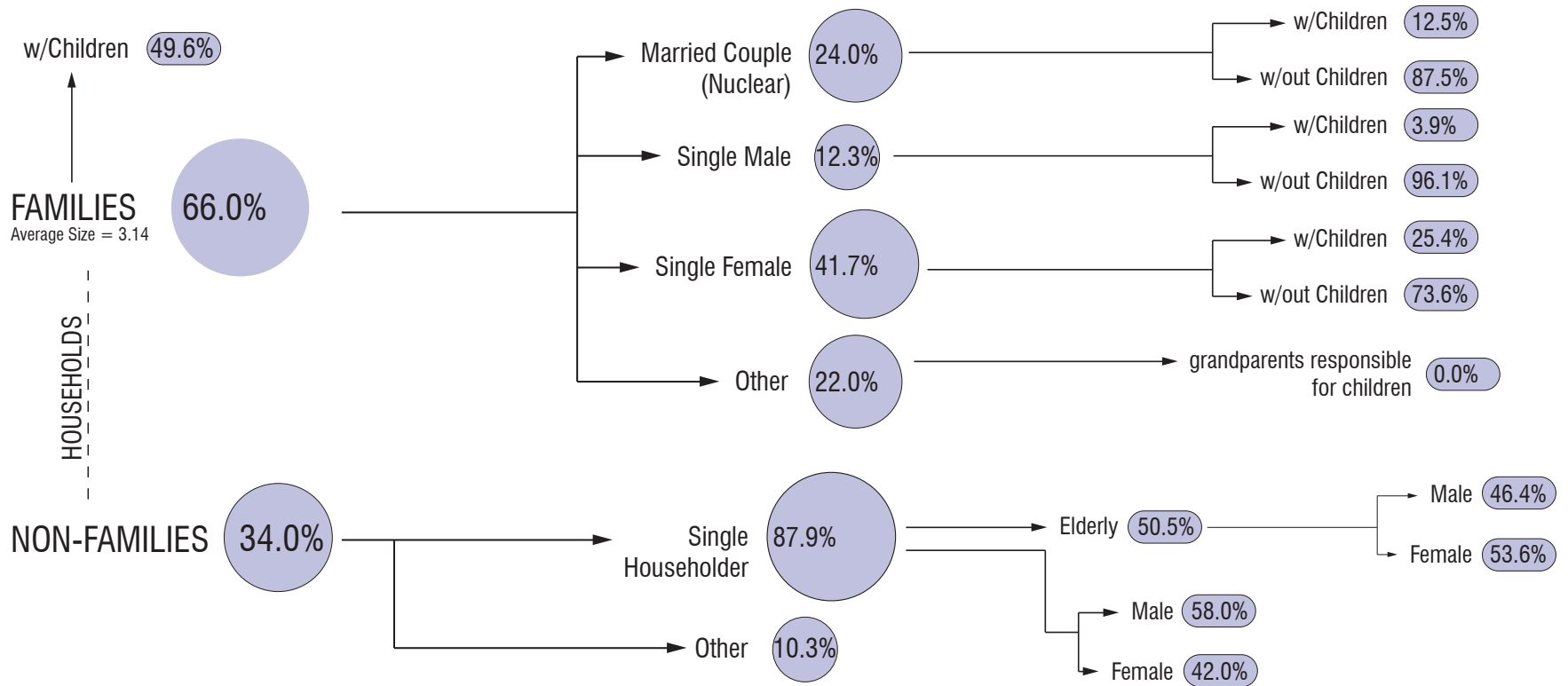
(Data Source: US Census Data)



Increasing Home Size



UNITED STATES DEMOGRAPHICS, 2010



AGE: 0-18 40.8% -----> Households w/ children under 18 47.0%

19-64 46.1%

65+ 13.1% -----> Households w/ adults over 65 30.4%

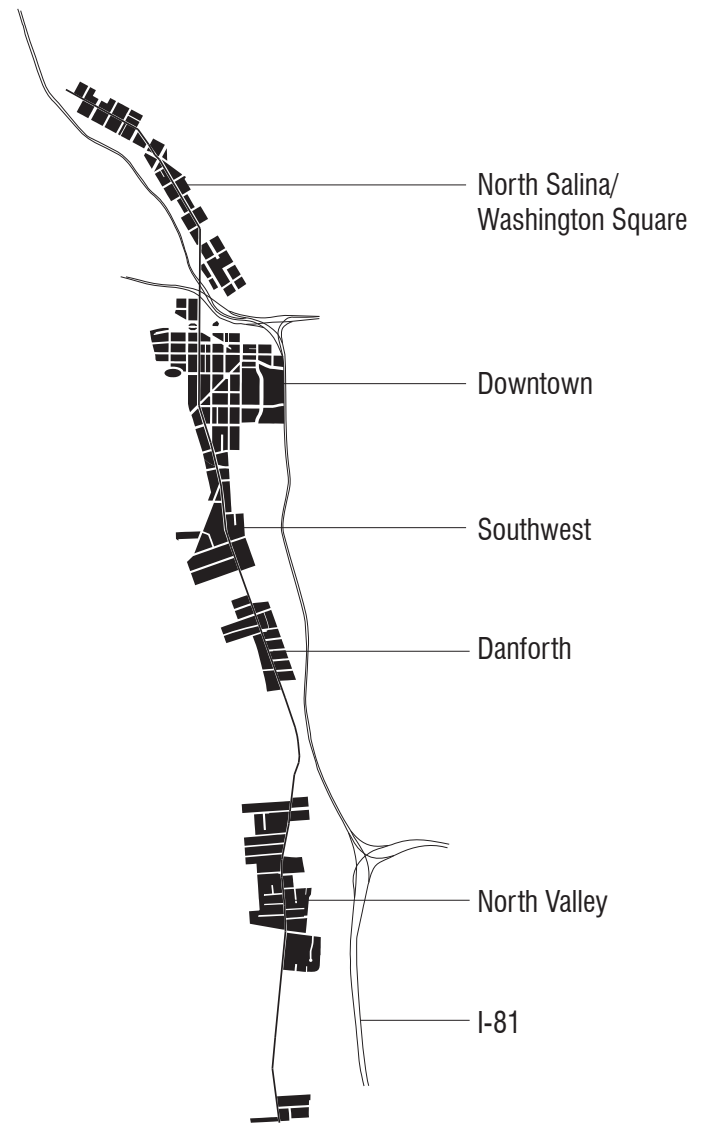
LOCATION OF HOME
1 YEAR PRIOR:

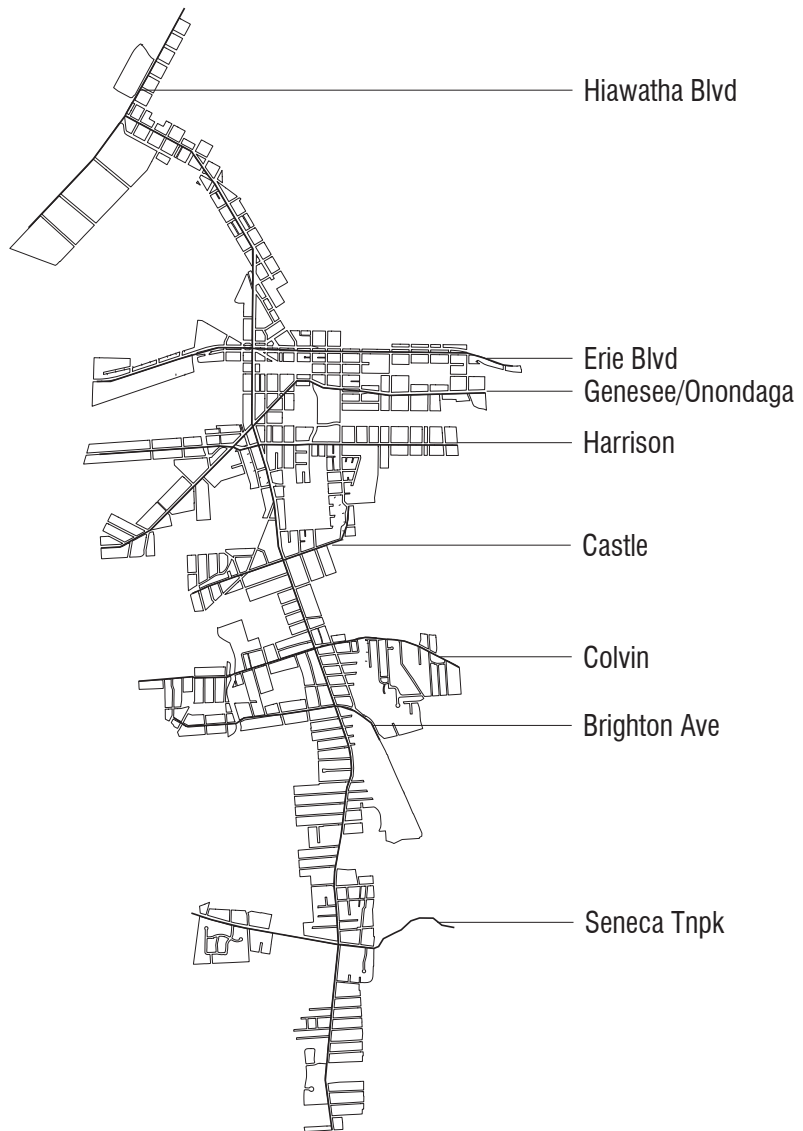


DANFORTH NEIGHBORHOOD
SYRACUSE, NEW YORK



Syracuse Vacant Property - Residential (2005)







Danforth Vacant Property (2011)



SOUTHSIDE ZONING

RESIDENTIAL DISTRICT, CLASS AA:

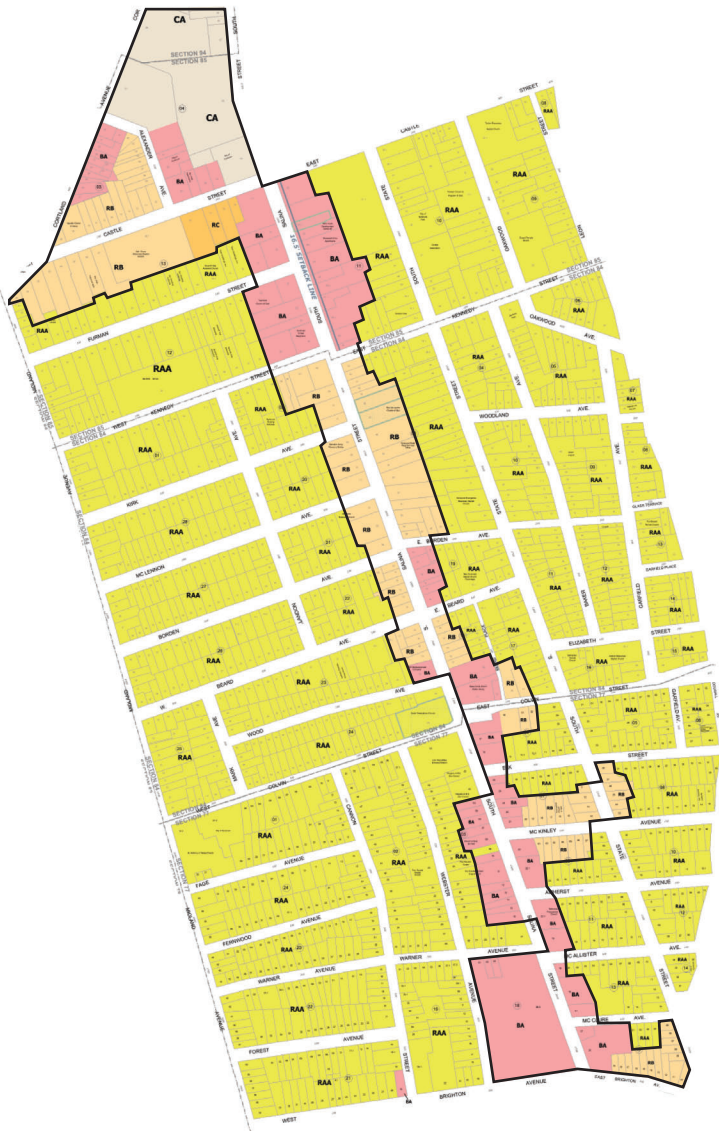
- *Small sized lots with one- or two-family dwellings at a moderate density
- *Amenities and characteristics associated with low-density residential developments
- *Permitted uses: one- or two-family dwellings, churches/schools, private swimming pools, municipal buildings, firehouses, public golf courses, day care centers, private garages
- *Front setback of 20', side yard of at least 4', min. rear yard of 20' or 15% of lot depth
- *Max. structural coverage of 30%, max. parking coverage of 35%
- *Density requirements: 4000 sf min. for single-family and 2000 sf min. for each dwelling of multi-family
- *No height limitations

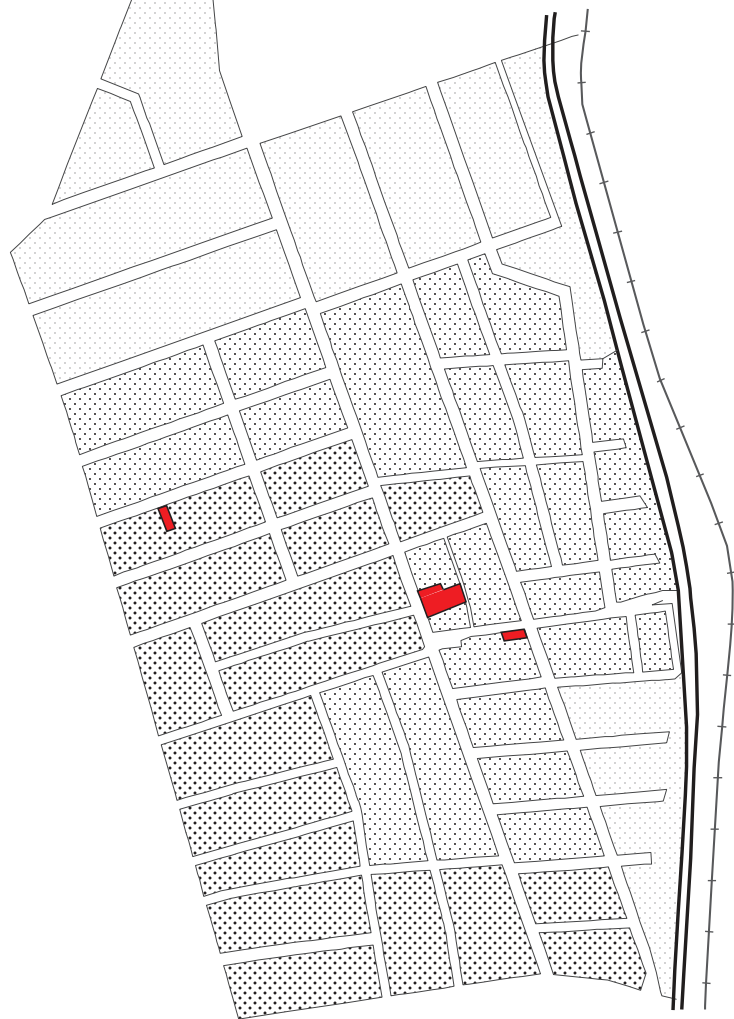
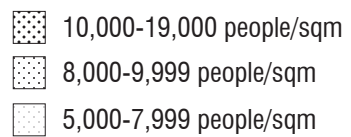
RESIDENTIAL DISTRICT, CLASS B:

- *High density development for single- and multi-family dwellings
- *Permitted uses: single- and two-family dwellings, multi-building and planned developments, churches/schools, private swimming pools, municipal buildings, firehouses, multi-family dwellings and apartment houses, university buildings, hospitals, institutions, parking
- *Min. front setback of 10', min. side yard of 4', min. rear yard of 20' or 15% lot depth
- *Max. structural coverage of 30% for one- and two-family dwellings, 40% for other uses
- *Density requirements: 4000 sf min. for single-family, 3000 sf min. for each family of two-family dwellings, 1000 sf min. for each family of multi-dwelling buildings

LOCAL BUSINESS DISTRICT, CLASS B:

- *Intensive land development for mixed-residential, retail, service and certain industrial uses
- *Permitted uses: local retail and service stores, office buildings, hotels, motels, banks, studios, galleries, public buildings, restaurants, community centers, bakeries, laundries, etc.
- *Single to multi-dwelling residential buildings
- *Specific requirements for adjoining buildings and frontage
- *Maximum of 100% building coverage except for single-family dwellings
- *Density requirements: 1000 sf min. for each family of multi-dwelling buildings



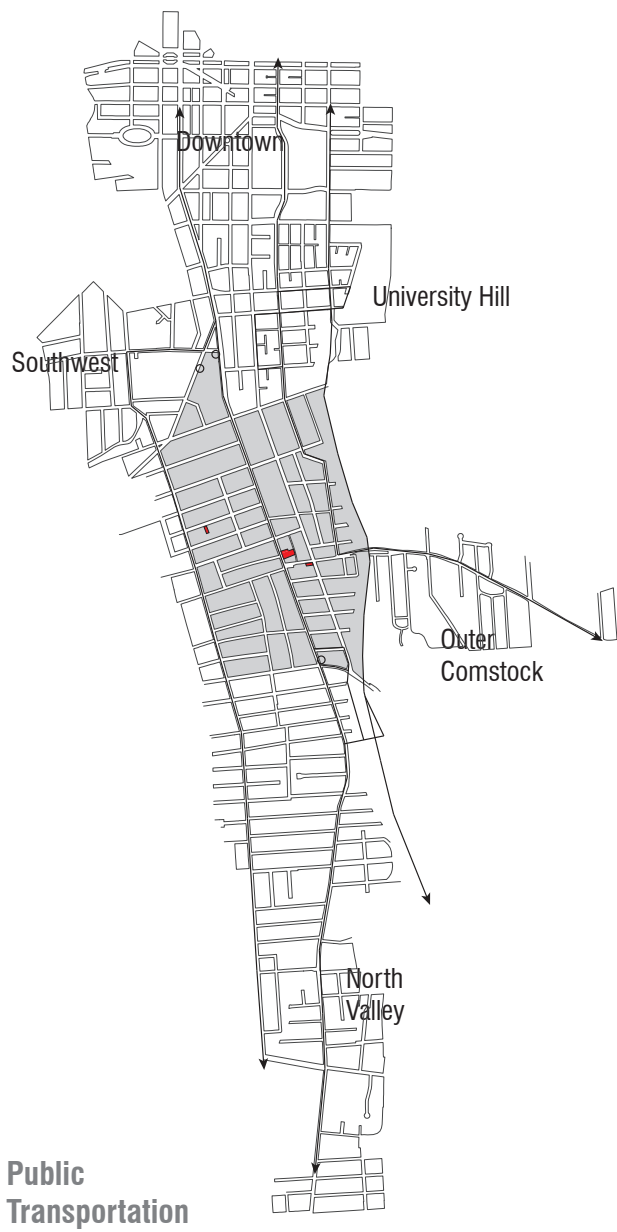


Danforth Population Density (2010)



Neighborhood Services

Local businesses, markets, schools, churches, community centers, libraries, etc.

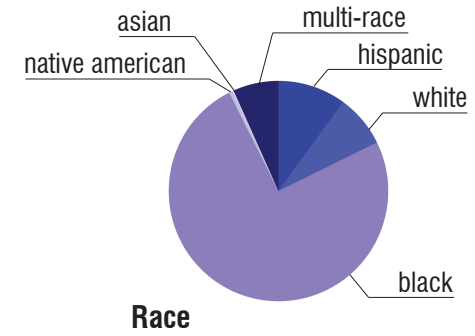
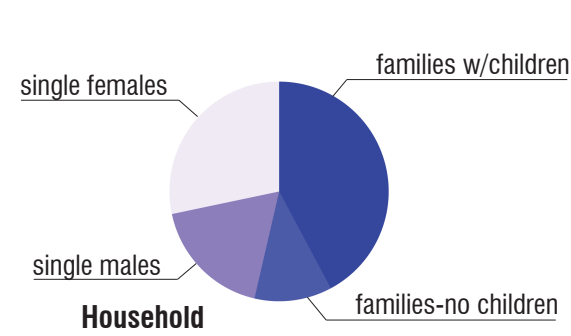
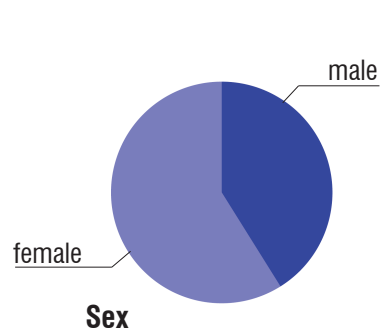
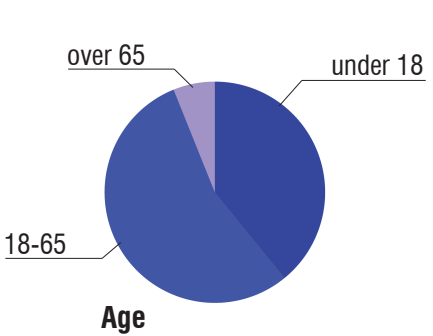


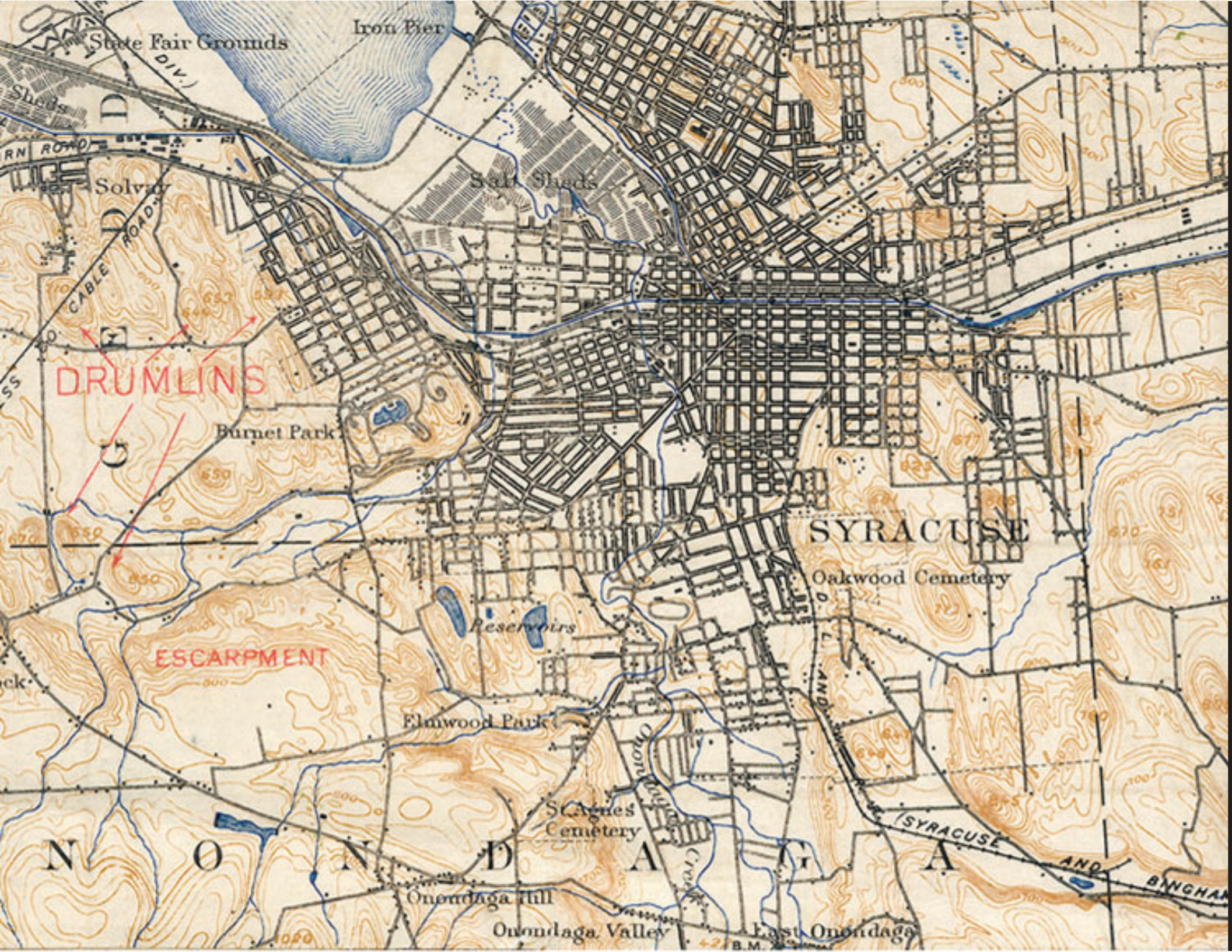
CITY QUICK DATA

SYRACUSE

USA

| | | |
|--|-----------------|------------------|
| Population | 145,170 | |
| under 5 | 7.0% | 6.5% |
| under 18 | 23.0% | 23.7% |
| over 65 | 10.6% | 13.3% |
| females | 52.3% | 50.8% |
| | | |
| white | 56.0% | 78.1% |
| black | 29.5% | 13.1% |
| native am. | 1.1% | 1.2% |
| asian | 5.5% | 5.0% |
| hispanic | 8.3% | 16.7% |
| multi-race | 5.1% | 2.3% |
| | | |
| Living in same house >1 yr | 71.4% | 84.2% |
| Foreign born | 10.3% | 12.7% |
| Non-english spoken at home | 15.6% | 20.1% |
| | | |
| High school graduates | 80.6% | 85.0% |
| Bachelors or higher | 25.6% | 27.9% |
| | | |
| Home ownership | 41.2% | 66.6% |
| % of units in multi-unit structure | 58.4% | |
| Median value of owner occupied units | \$83,400 | \$188,400 |
| Households | 56,445 | |
| Persons per household | 2.35 | 2.59 |
| Per capita income | \$17,866 | \$27,334 |
| Median Household Income | \$30,891 | \$51,914 |
| Persons below poverty level | 31.1% | 13.8% |
| | | |
| Density (persons/sq.mile) | 5,796.8 | |





DRUMLINS

ESCARPMENT

SYRACUSE

Oakwood Cemetery

Reservoirs

Elmwood Park

St. Agnes Cemetery

Onondaga Hill

Onondaga Valley

East Onondaga

SYRACUSE AND BINGHAM

BINGHAM

Iron Pier

State Fair Grounds

Solvay

Salt Sheds

Burnet Park

Sheds

WILEY ROAD

CABLE ROAD

ROAD

ROAD

ROAD

ROAD

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DANFORTH: HISTORY

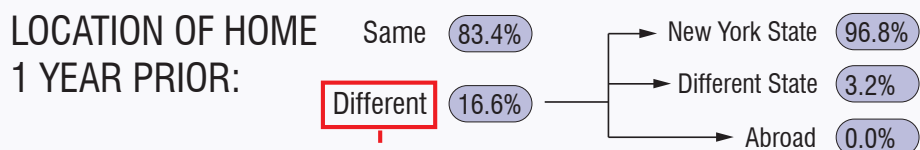
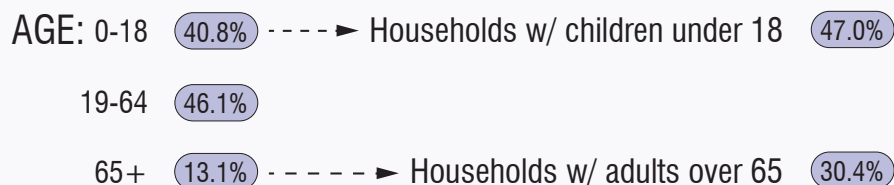
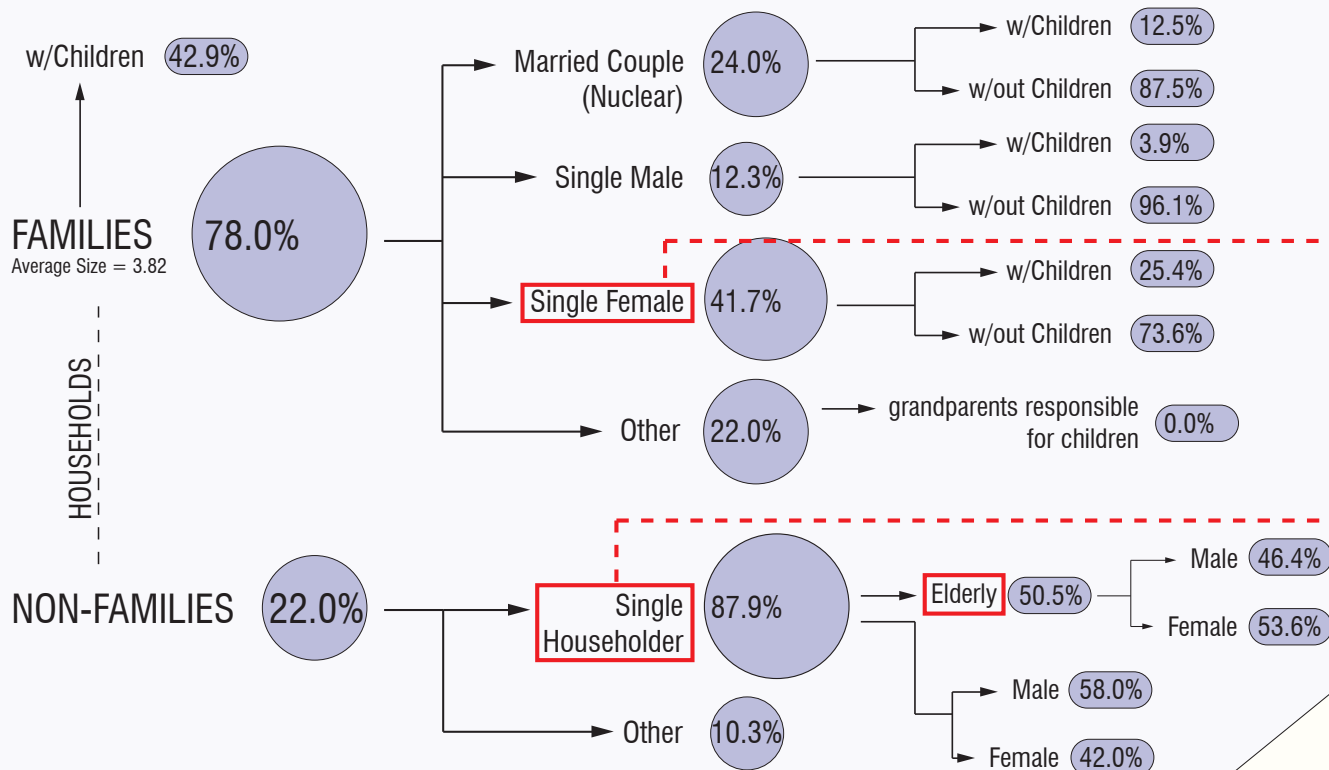
The land on which the city present city of Syracuse, NY rests was originally inhabited by the Onondagas, one of the five Native American tribes of the Iroquios Federation. Settlement of the city began during the late 18th century with the village earning its current name in 1824. The following year marked the opening of the Erie Canal which allowed for transportation connections to areas across New York state, including New York City. During the mid-19th century, Syracuse experienced rapid growth associated with its development as an important salt producer and industrial center. While salt production declined after the Civil War, manufacturing remained a vital part of the economy up until the early 1970s. The city's population had reached its peak of 221,000 by 1950 (citation). Since then, population has continued to decline although the metropolitan area remains stable.

The Danforth Neighborhood - today marked by U.S. census tract 53 - began its history as an important village along the region's north-south thoroughfare just south of downtown Syracuse. It is centered upon South Salina Street, which was, in the 19th century, the route of the Syracuse and Onondaga Railway as well as a major horse-car line (citation). The Village of Danforth was incorporated in 1874 and the following one hundred years saw the area develop as a popular neighborhood for middle-class residents - in a way, Syracuse's first suburb. However, the construction of I-81 greatly diminished Danforth's importance as South Salina no longer acted as the regions primary north-south thoroughfare.

Currently, Danforth is notable as one of several poverty-stricken neighborhoods in Syracuse. It contains a high percentage of minorities, particularly African-Americans. Existing poverty combined with the recent recession and associated collapse of the housing bubble has resulted in a significant number of vacant lots. According to 2010 U.S. census data, of the 696 total housing units, 21.3% remain vacant. Nearly 80% of these structures were constructed before 1950, most of them detached 1 or 2 unit homes. Comparatively, 70% of residents have moved into the neighborhood since 2000, highlighting the rapidly changing demographic and household type of these homes and the inadequacy of current housing stock (citation). The current housing crisis along with residents' inability and lack of motivation to maintain homes irrelevant to their needs has caused the structures to fall into disrepair.

Therefore, this neighborhood acts as an appropriate area to test a flexible, modular housing system. The three sites chosen in Danforth represent different conditions, thus testing the design's ability to adable to unique site conditions as well as different users.

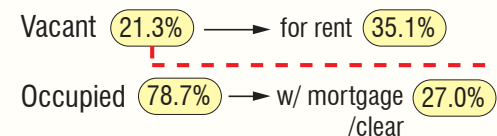
DANFORTH NEIGHBORHOOD, SYRACUSE: CENSUS TRACT 53



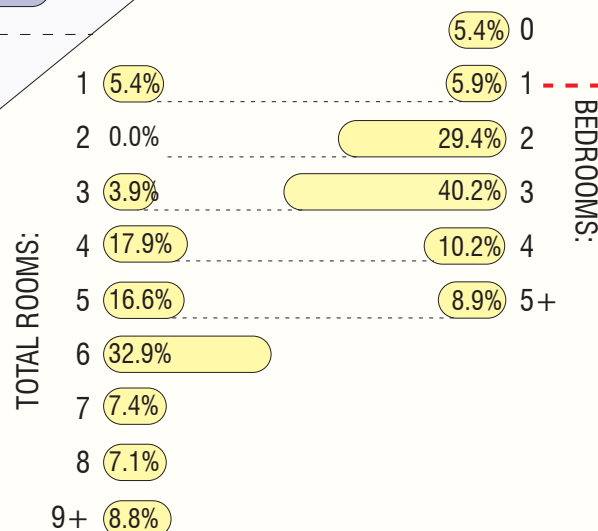
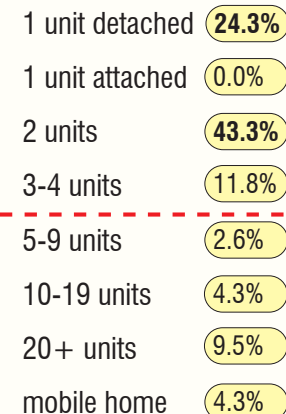
EXISTING DEMOGRAPHICS

 = potential target demographic

TOTAL UNITS = 696



UNITS IN STRUCTURE:



EXISTING HOUSING STOCK

UNDESIRABLE

Vacancy is no market/econo and poorly ma

CHANGING FAMILI

The Danforth neigh primarily of 1 or 2 u before the 1940s. T with the nuclear fan many families head without children) ar

OVERSIZED HOUSING

With over 19 percent of re maximum 10 percent of O are generally failing to acc household size. Danforth housing size of 3.2 person of oversize housing consi home features 6 rooms ar

ELDERLY

With an outdated housing the Danforth neighborho significant elderly populat live at home.

RAPID CHANGE

16.6 percent of residents hood within the past year the past 10 years. With a demographics are changi housing now in place is n this change.

ABILITY

not only indicative of a poor economy but also a rigid, out-of-date maintained housing stock.

UNIT TYPES

neighborhood is comprised of unit detached homes built in the early 20th century. These homes were designed for the middle class as the target group. Today, they are occupied by single women (many of whom are on public assistance), a mismatch for the existing housing stock.

residents living alone and a small number of 0 or 1 bedroom homes, units that do not accommodate for a decreasing household size. This mismatch strengthens the argument for the need for more affordable housing considering the area's average income and 3 bedrooms.

housing stock and lack of flexibility, the existing housing stock is ill-suited to house a growing population, specifically those who are low-income.

have moved in the neighborhood in the last 10 years (2010), and 70 percent within the last 5 years, indicating a quick turnover of residents, suggesting a high level of mobility. The rigid housing stock is not capable of accommodating

ASSOCIATED ISSUES



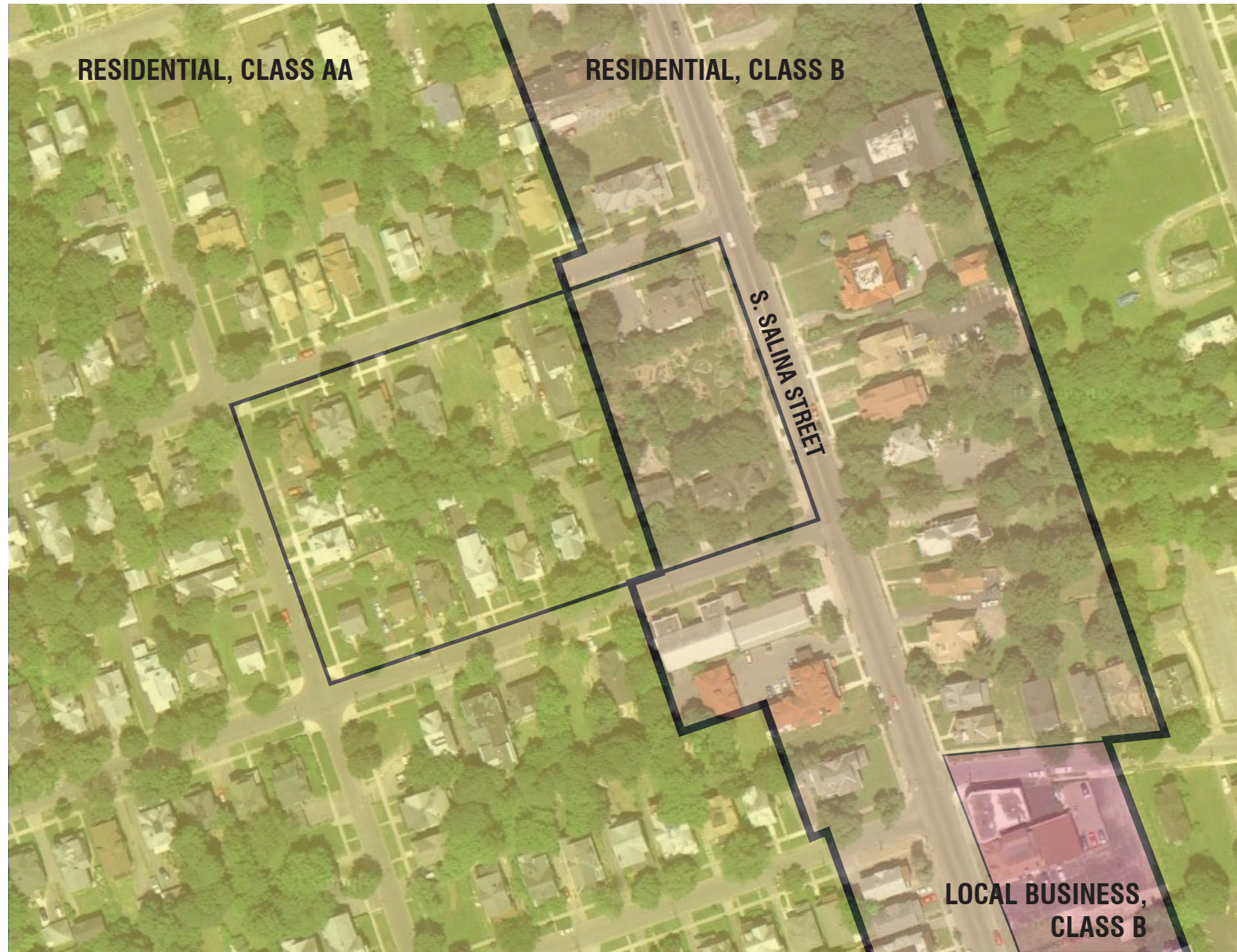
Poor housing conditions typical of the Danforth Neighborhood.

SITE LOCATION



(Map Source: Google Earth)

SITE ZONING



(Map Source: Google Earth)

EXISTING HOUSING STOCK



Location: S-1
Type: Multi-family detached
Condition: Good



Location: S-2
Type: Multi-family detached
Condition: Good



Location: S-3
Type: Multi-family detached
Condition: Good



Location: S-4
Type: Multi-family detached
Condition: Partially Vacant



Location: S-5
Type: Multi-family detached
Condition: Good



Location: N-2
Type: Single-family detached
Condition: Good



Location: N-3
Type: Multi-family detached
Condition: Good-Poor



Location: N-4
Type: Single-family detached
Condition: Poor / Vacant



Location: N-5
Type: Vacant Lot
Condition: Vacant



Location: N-6
Type: Multi-family detached
Condition: Good



Location: S-6
Type: Single-family detached
Condition: Poor / Vacant



Location: S-7
Type: Vacant Lot
Condition: Vacant



Location: W-1
Type: Single-family detached
Condition: Poor



Location: W-2
Type: Multi-family detached
Condition: Poor



Location: N-1
Type: Single-family detached
Condition: Good



Location: N-7
Type: Multi-family detached
Condition: Good



Location: E-1
Type: Multi-family detached (shelter)
Condition: Good



Location: E-2
Type: Vacant Lot
Condition: Vacant

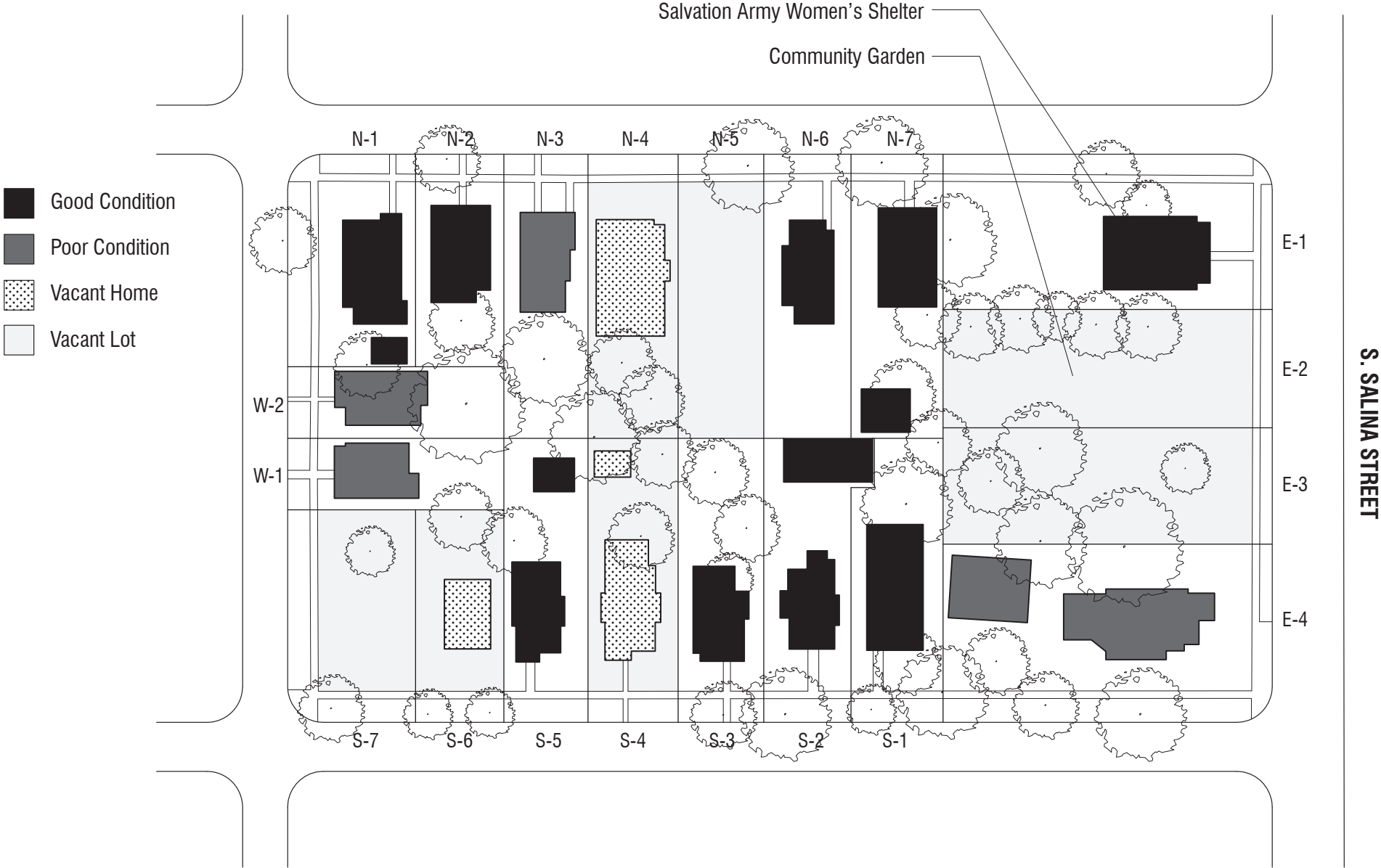


Location: E-3
Type: Vacant Lot
Condition: Vacant

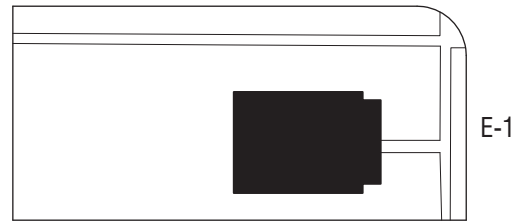


Location: E-4
Type: Single-family detached
Condition: Poor

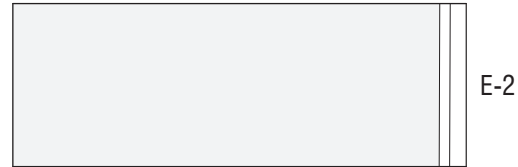
CURRENT HOUSE CONDITIONS



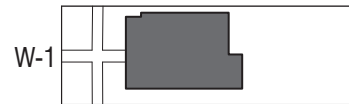
LARGE CORNER LOT
PRIMARY STREET



LARGE 'SLOT' LOT
PRIMARY STREET



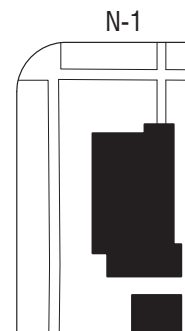
SMALL 'SLOT' LOT
SECONDARY STREET



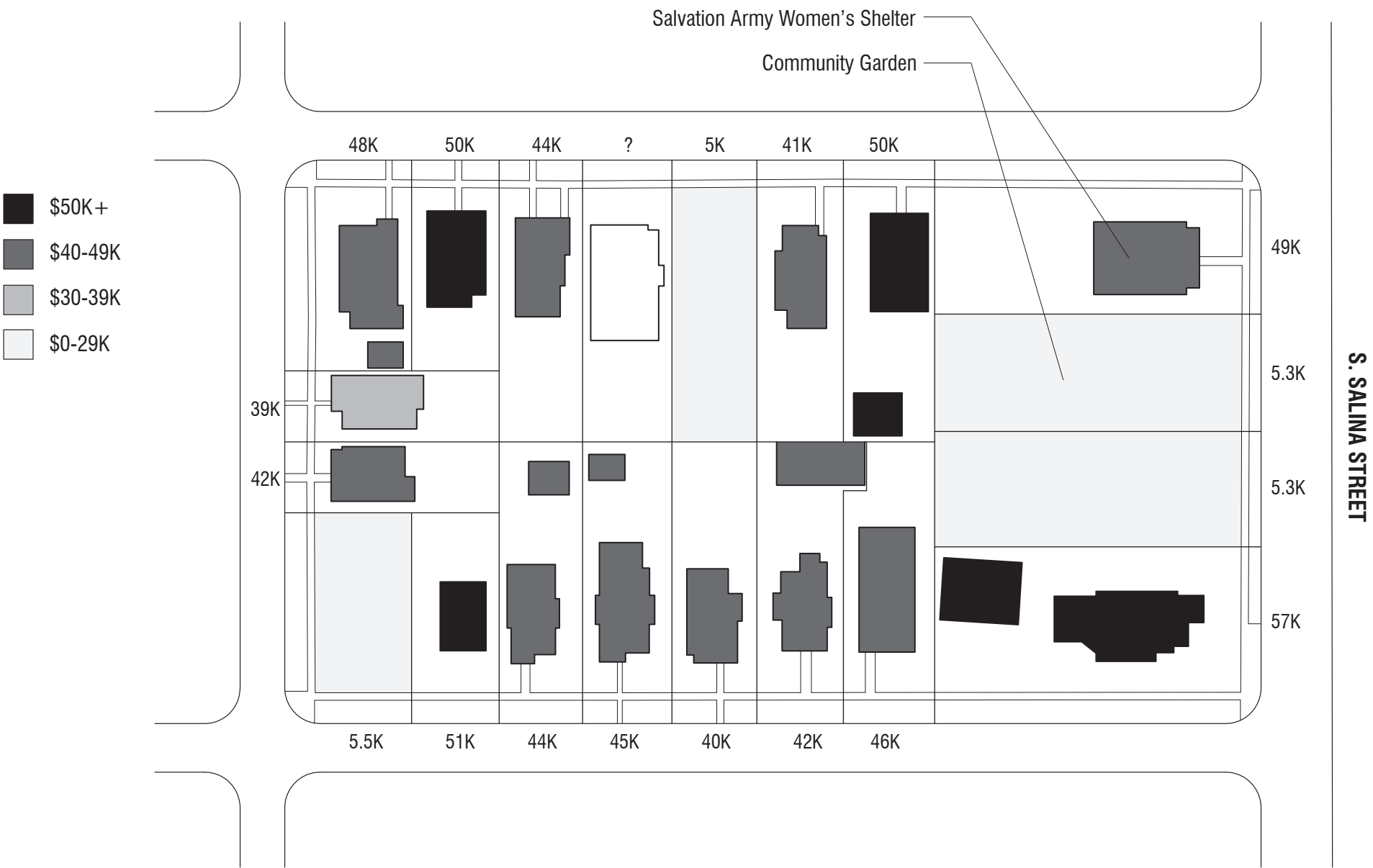
LONG 'SLOT' LOT
SECONDARY STREET



MEDIUM CORNER LOT
SECONDARY STREET



CURRENT HOME VALUES



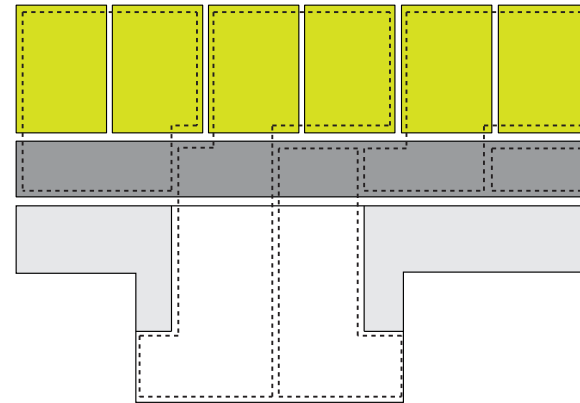
SQUARE FOOTAGE



EFFICIENCY AND AFFORDABILITY

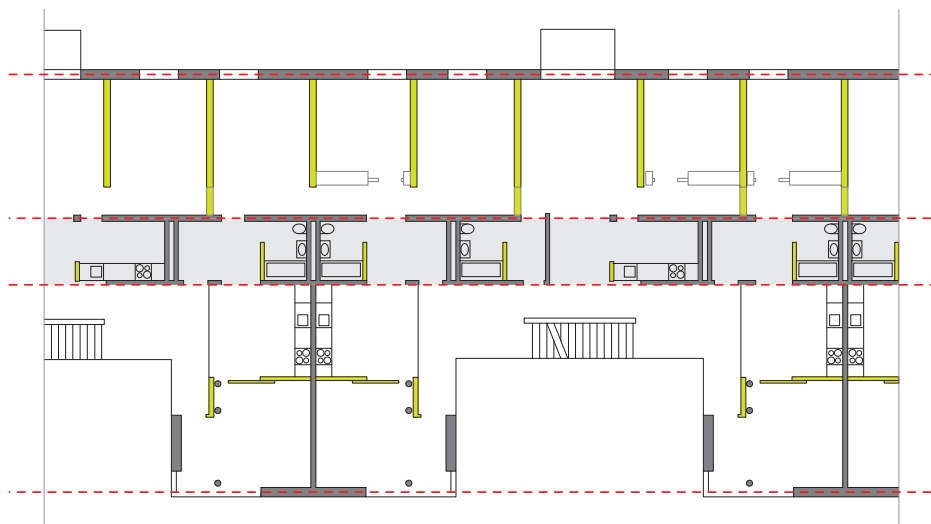
Zurich, Switzerland

UBERBAUUNG HELLMUTSTRASSE ADP ARCHITEKTUR (1991)

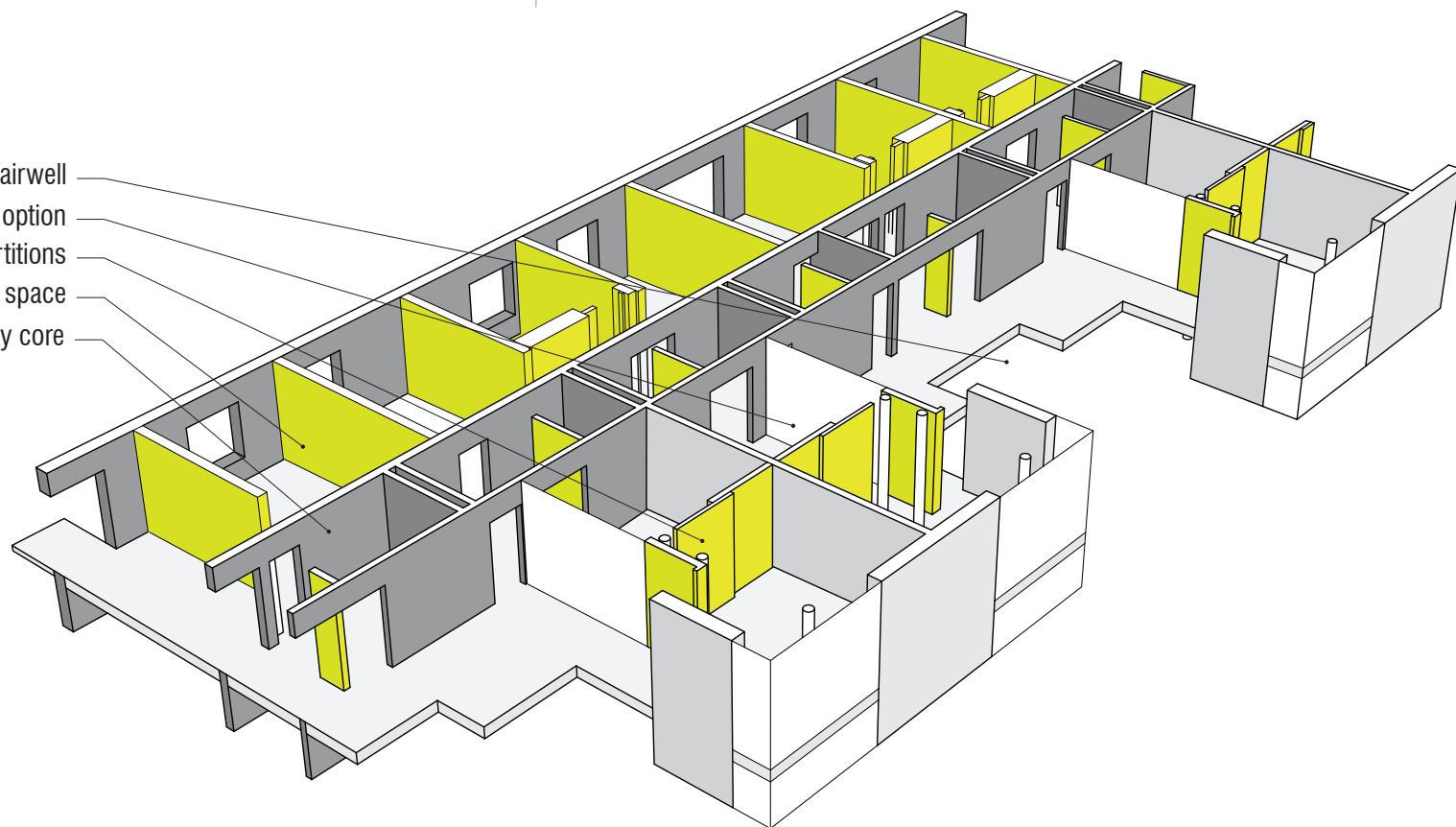


Dwelling Units 30+
Unit Types one room apts.
multi-room apts.
studio apts.

TARGET GROUPS Families
Couples
Singles
Middle-, high-income



- Shared stairwell
- Additional living space/studio apt. option
- Movable partitions
- Flexible, unprogrammed space
- Utility core



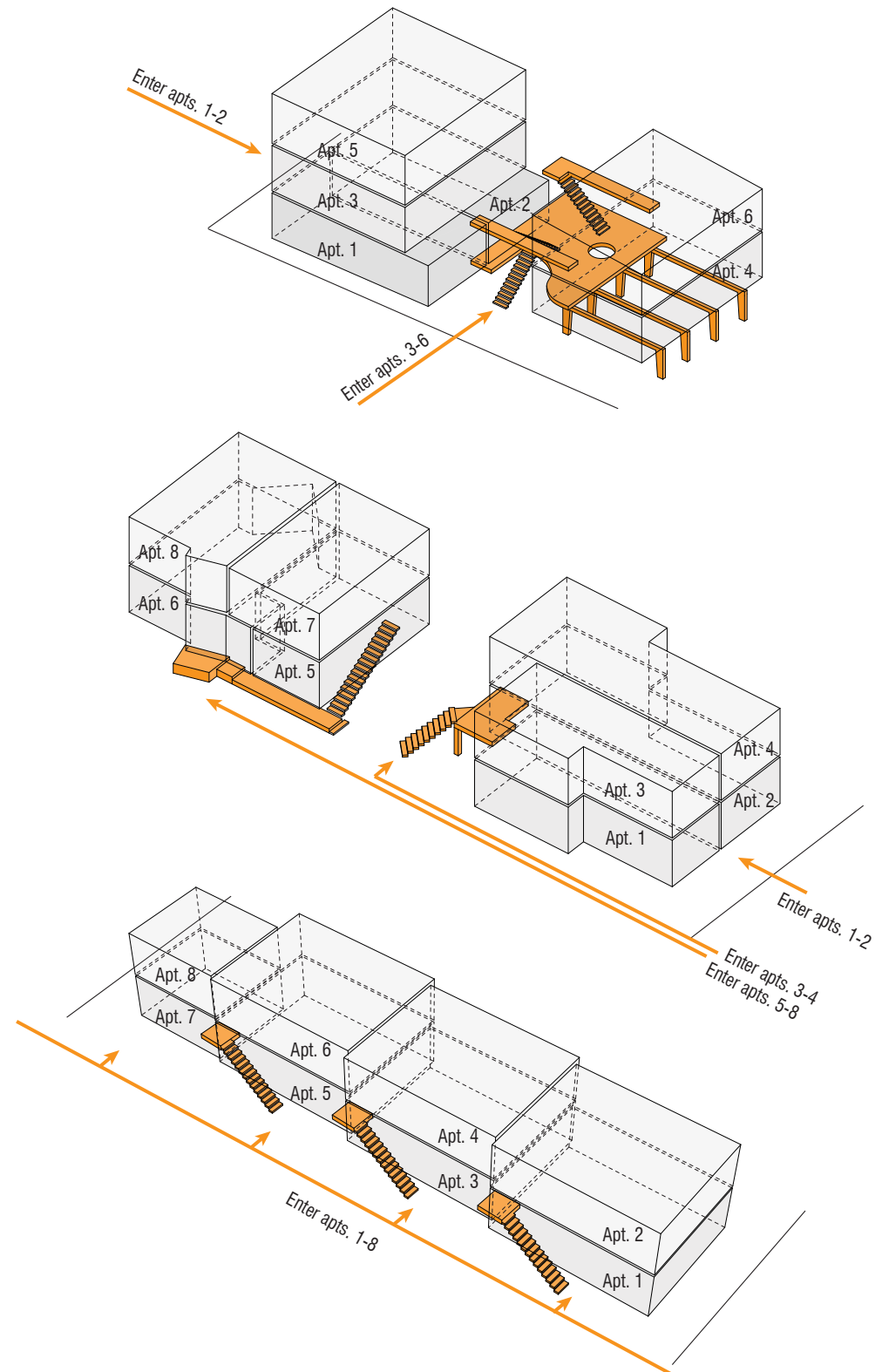
Santa Monica, California

INFILL HOUSING KONING EIZENBERG (1987)

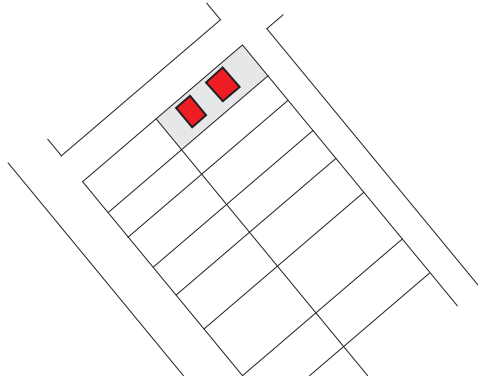


An infill strategy was employed for Koning Eizenberg's affordable housing project in Santa Monica, California. Distribution of the project on multiple sites ensured that public resistance was minimum. Initially, the architects envisioned a modular design system in which similar units could be inserted into different lot conditions. However, the extreme variety of sites and constraints made it necessary for each lot to have a unique layout.

Housing on Fifth Street represents a typical corner condition, while the other two sites sit mid-block. This Santa Monica neighborhood is similar to the Danforth neighborhood of Syracuse in that both are moderately dense conditions of suburbanism with Santa Monica being slightly more urban. This project is an exemplar of a new take on detached housing and housing for low-income residents.



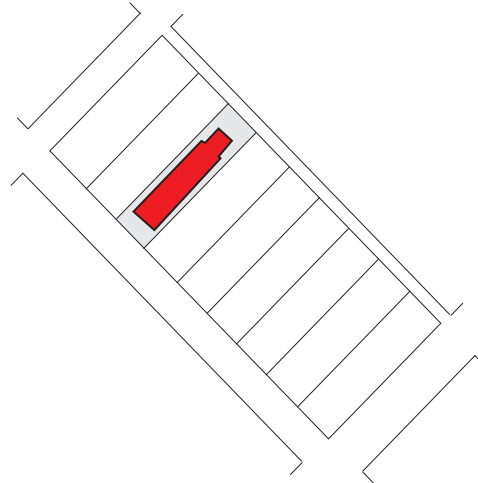
Corner condition
Multi-unit
Two buildings
Half-block depth
40' site width



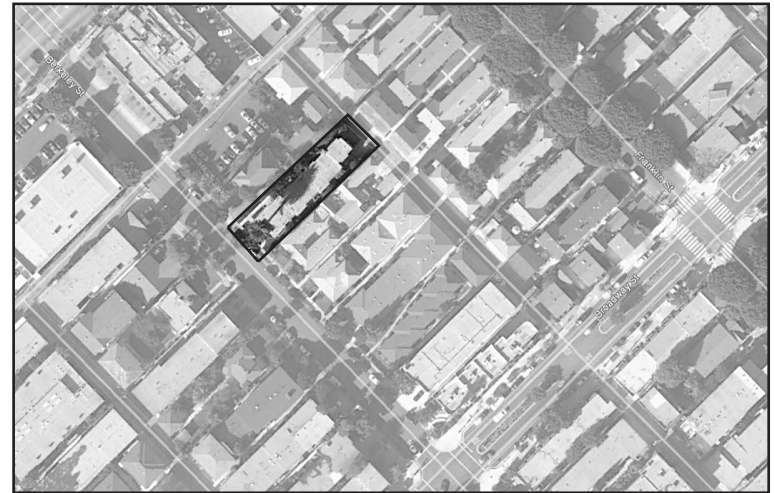
FIFTH STREET



Mid-block condition
Multi-unit
Single buildings
Through-block depth
35' site width



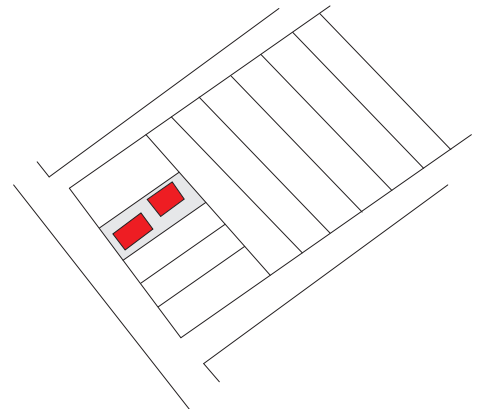
BERKELEY STREET



SIXTH STREET

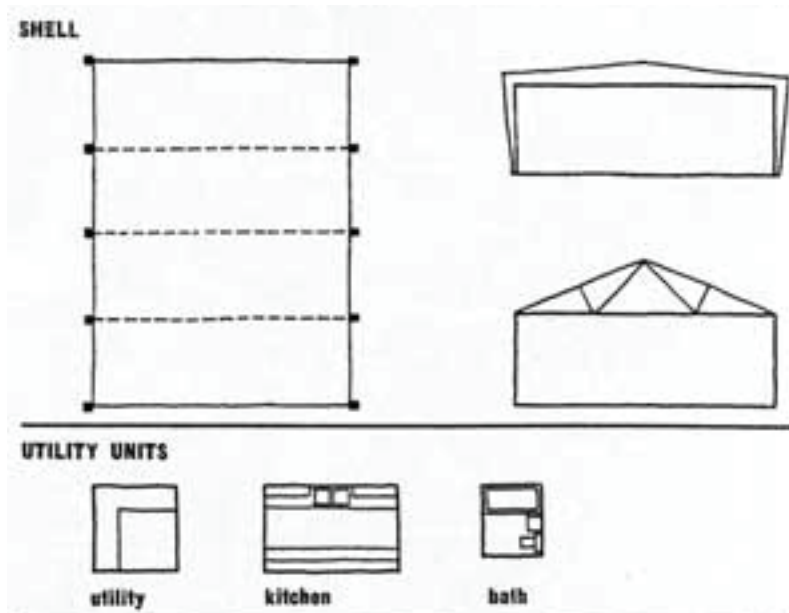


Short-edge condition
Multi-unit
Two buildings
Half-block depth
40' site width



Competition

NEW HOUSE 194X SOM (1942)

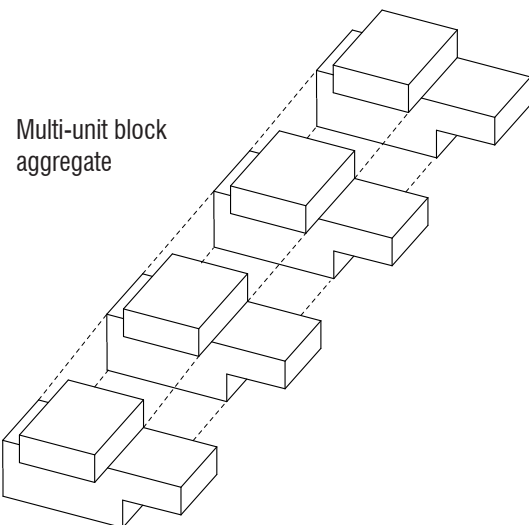
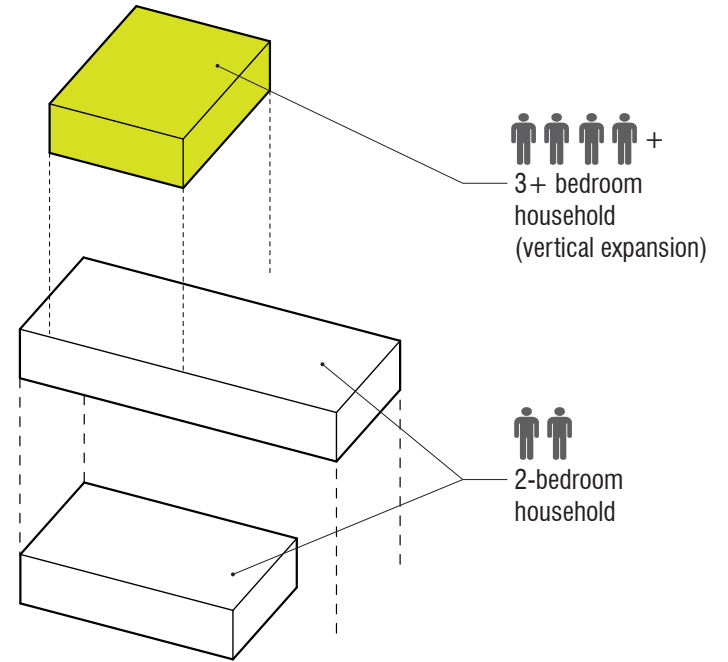
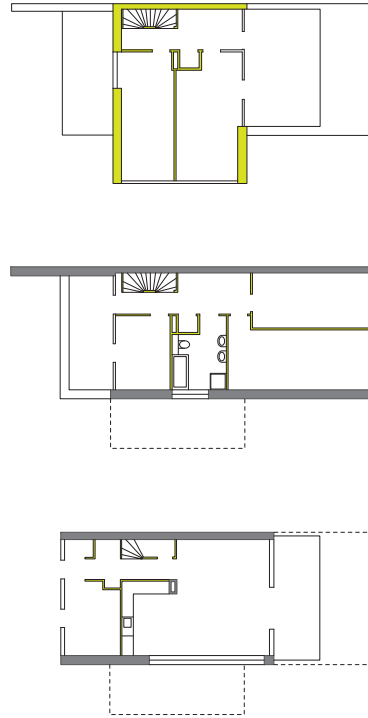


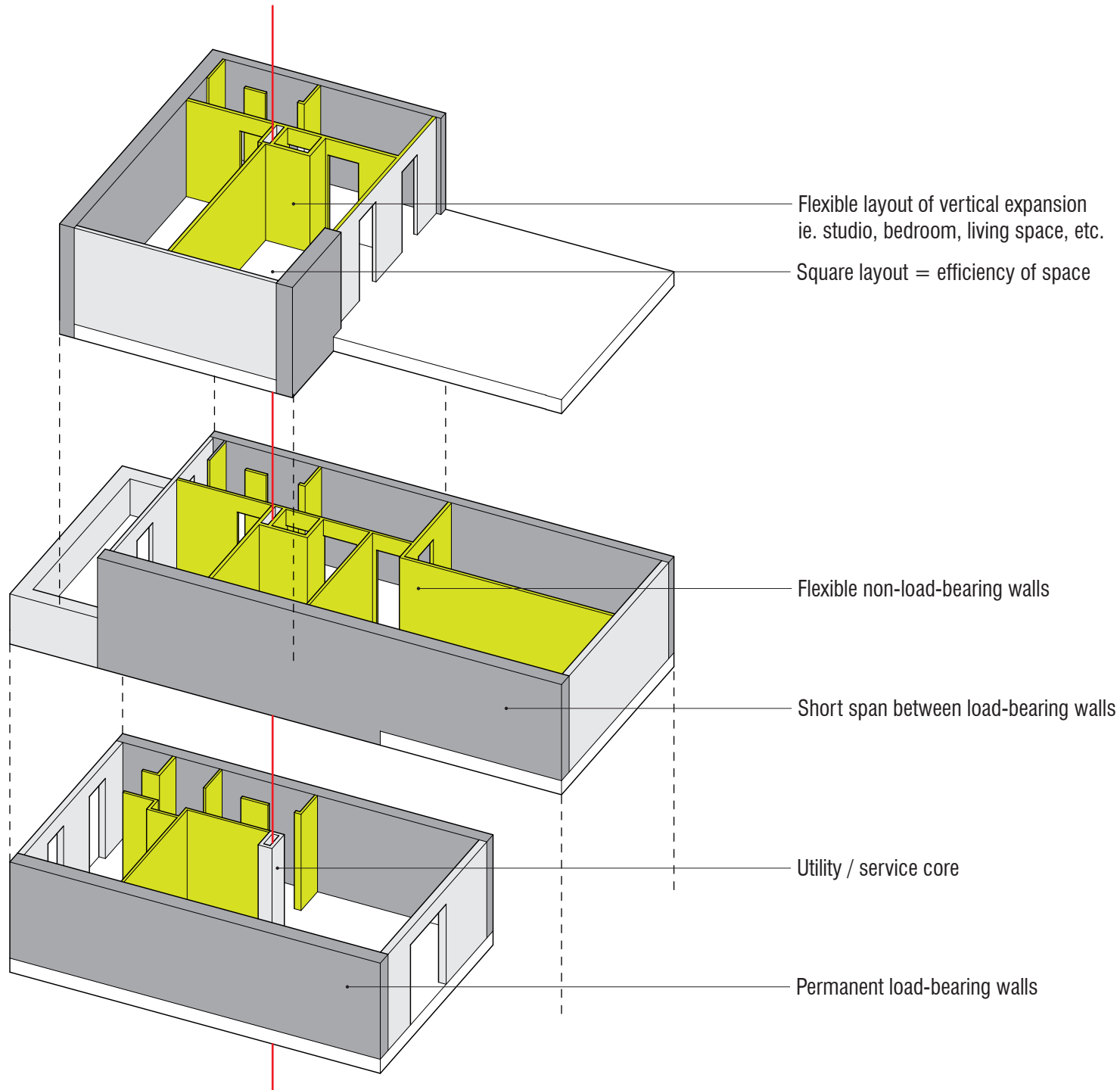
An infill strategy was employed for Koning Eizenberg's affordable housing project in Santa Monica, California. Distribution of the project on multiple sites ensured that public resistance was minimum. Initially, the architects envisioned a modular design system in which similar units could be inserted into different lot conditions. However, the extreme variety of sites and constraints made it necessary for each lot to have a unique layout.

Housing on Fifth Street represents a typical corner condition, while the other two sites sit mid-block. This Santa Monica neighborhood is similar to the Danforth neighborhood of Syracuse in that both are moderately dense conditions of suburbanism with Santa Monica being slightly more urban. This project is an exemplar of a new take on detached housing and housing for low-income residents.

HOUSEHOLD MAKEUP AND INCLUSIVITY

Almere, Netherlands
WATER VILLAS UN STUDIO (2001)





METHODS: ADAPTABLE DESIGN

“The notion of literal adaptability presents problems when it is translated from the realm of the ideal into that of the real...” - Alan Colquhoun

CONSTRUCTION PRINCIPLES

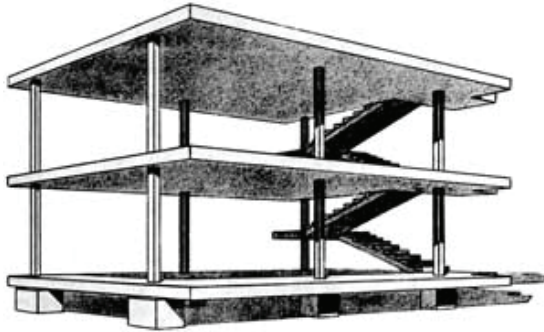
“The philosophy behind the notion of flexibility is that the requirements of modern life are so complex and changeable that any attempt on the part of the designer to anticipate them results in a building which is unsuited to its function and represents, as it were, a ‘false consciousness’ of the society in which he operates.” - Alan Colquhoun

To understand the methods and techniques required of flexible design, one must first be aware of what creates inflexible buildings. In the most reductive sense, inflexible construction is the result of three components: the inflexible wall, the inflexible roof and inflexible services/systems. Wall systems become difficult to alter when they are loadbearing and particularly when they are of cavity wall construction which is not easy to open. When interior walls are loadbearing and spaces are designed to a specific size and program, reconfiguration requires attention to the structural system. Other walls or partitions are inflexible simply because of their solidity and immobility in both the short-term and long-term. Expanding vertically is frequently hindered by the construction of the typical roof, supported with trussed rafters. Services like plumbing and electricity usually buried behind walls, hidden from view or inserted through framework that makes reworking their configuration nearly impossible (Schneider 164).

Fig. x
Construction of domino.21 in Madrid, Spain designed by J.M. Reyes and students from Universidad-Empresa. 2005
pg. 17, “La experiencia [domino.21] in volucro a la madera.” Boletín de Información Técnica. 2005



SOFT FLEXIBILITY INDETERMINACY



- *Tactics which allow for indeterminacy
- *User adapts plan according to needs
- *Designer works in background as 'facilitator'
- *Demands more space and some redundancy
- *Relaxed approach to technology

Soft flexibility is based on the idea that a less controlling design strategy allows for more control on the user's end. This typically results in plans and forms that are malleable and lack specific boundaries. This approach is generally more difficult for the architects as it requires them to work in the background as a facilitator. In terms of technology, soft design enables housing to "unfold in a manner not completely controlled by the foreground of construction techniques" (Schneider 8).

Soft architecture "awaits the imprint of an identity. For better or worse, it invites you to remake it, to consolidate it into a shape you can live in" (Raban).

HARD FLEXIBILITY SPECIFICITY



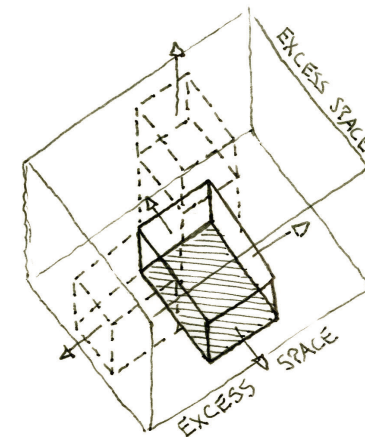
- *Elements specifically determine multiple uses
- *Designer works in the foreground
- *Determination of spatial use over time
- *Employed where space is at a premium
- *Common approach of architects

Hard flexibility is a highly determinate way to design adaptable spaces. The architect has more control over the design process and attempts to predict that way that spaces will be used over time. Common components of flexible design include moveable/sliding partitions and doors and transformable furniture. Hard technologies specifically account for transformability ie. modular systems.

The categories of hard and soft flexibility are not mutually exclusive and frequently, hard systems allows for soft, indeterminate methods to work.

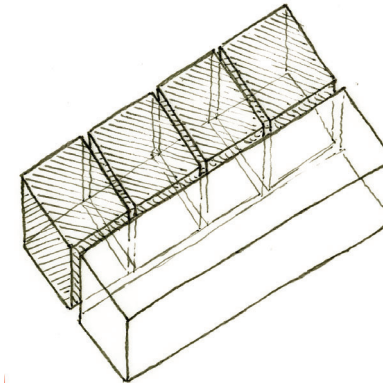
VERTICAL / HORIZONTAL ADDITION

Perhaps the most basic principle of flexibility is the ability for spaces to increase and decrease as needed. **This potential should be explored in the design phase** rather than post-construction in order to allow for simple alterations to structural and service systems. In some cases, space outside housing units may be allocated solely for expansion. This incorporation of “slack space” actively invites future changes (Schneider 1985).



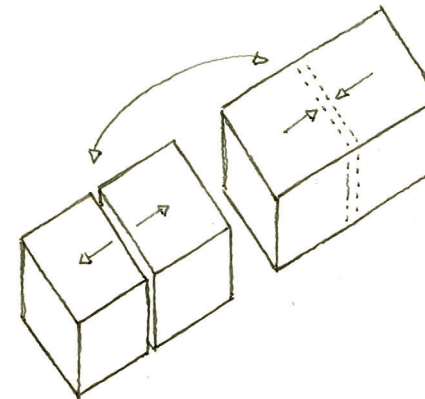
NEUTRAL FUNCTIONALITY

Avoiding labeling rooms or programming them for specific uses enables occupants to redefine spaces over time. Typically this strategy involves designing a number of **rooms at a similar scale** thus giving no clear indication of their intended use. Although this may mean providing slightly more or less space than is standard for any given room, for example a living room, occupants are more likely to experiment and use spaces for a variety of traditionally unrelated activities.



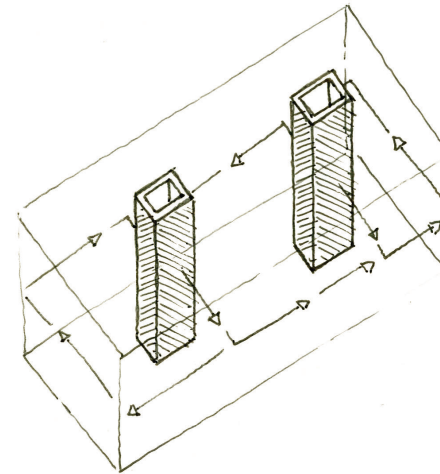
JOINING & DIVISION

Joining and dividing spaces is critical for both single-family dwellings and multi-dwelling buildings. It allows for expansion and contraction of space as well as the ability for rooms to ‘change ownership’ in the case of multi-dwelling housing. This method need not be limited to the horizontal plane and projects that are **flexible in three dimensions typically offer the most options for adaptability**.



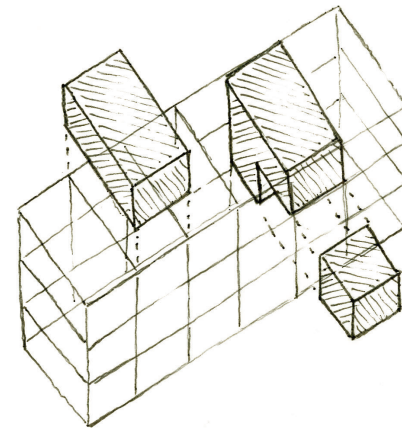
CORE VS SERVICE DISTRIBUTION

Location of the core is a critical element in determining the flexibility of a building. It is the most permanent of all components therefore it requires a position that allows it not to be intrusive to living space. **The core is directly linked to service distribution.** Services should be configured in such a manner that they are organized near more permanent elements (like structure) while still maintaining the ability to be easily altered in the future.



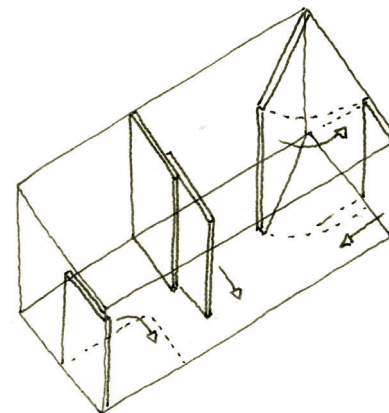
FRAME SYSTEM & INFILL

Frames are responsible for providing the support of a structure and a skeleton for the attachment of services. **The frame should not overdetermine the spatial infill** of a project and partitions, services and external walls should all be separate. "Although the word frame suggests a column and beam construction, the generic principle of the frame can be adapted across wall-based constructional systems, as long as one keeps a **separation between the permanent structural elements and the flexible infills elements**" (Schneider 192).



TRANSFORMABLE / EXCHANGEABLE PARTITIONS

Moveable partitions inherently fall into the category of 'hard flexibility.' While it is the most common approach to flexibility it can also be the **most limiting**. Generally speaking, these partitions are most successful when paired with other methods of flexible design. (Schneider 190). Nevertheless, elements like sliding doors and screens can greatly **increase the spatial configurations** of a home and allow rooms to be used for numerous different uses.



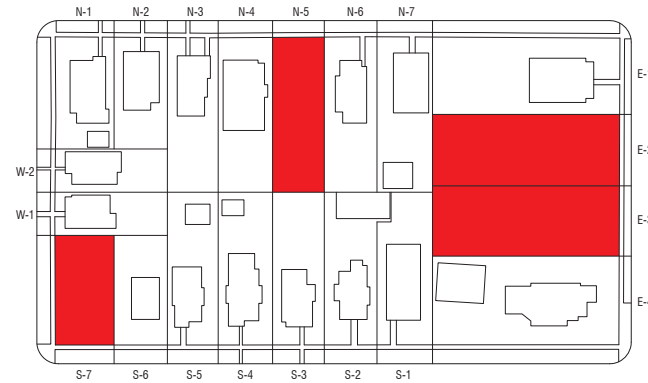
PROGRAMMING THE SITE AND DESIGN SPECULATION

Danforth Neighborhood, Syracuse, New York

Target Demographic for Danforth

| | Existing Danforth Demographic | Estimated Future Demographic | |
|---------------------------|-------------------------------|------------------------------|---|
| SINGLE ELDERLY | 10.0% | 10% | |
| SINGLES | 9.5% | 15% | Response to a trend in the increase of single householders and a rapidly decreasing average household size. |
| NUCLEAR / EXTENDED FAMILY | 19.5% | 15% | Response to the demise of the traditional nuclear family as well as a decreasing average household size. |
| SINGLE-HEADED FAMILY | 41.5% | 40% | |
| COUPLES | 17.0% | 20% | Response to an increase in household couples resulting from increased life expectancy. |
| | 97.5% | 100% | |

Strategy 1: Vacancy Infill



Site Programming

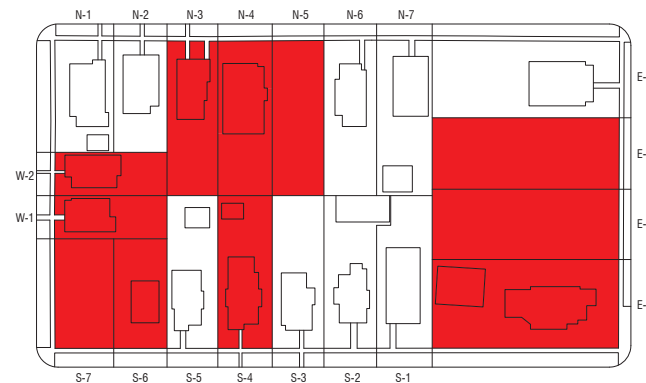
Single-family detached homes

Nuclear / extended family
Single-headed family

Apartment building

Single Elderly
Singles
Couples

Strategy 2: Selective Demolition



Single-family detached homes

Nuclear / extended family
Single-headed family

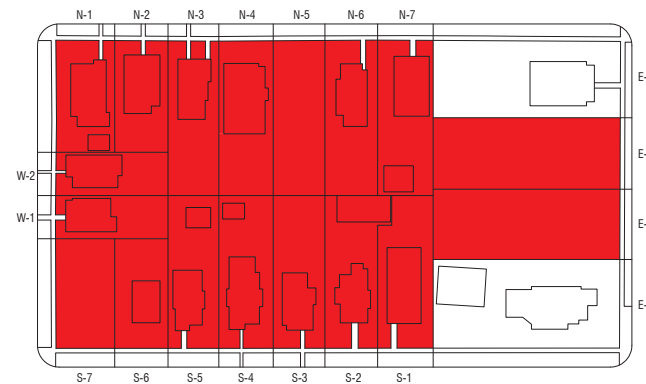
Multi-family detached homes

Nuclear / extended family
Single-headed family
Couples

Apartment building

Single Elderly
Singles
Couples

Strategy 3: Complete Redevelopment



Single-family detached homes

Nuclear / extended family
Single-headed family

Multi-family detached homes

Nuclear / extended family
Single-headed family
Couples

Apartment building

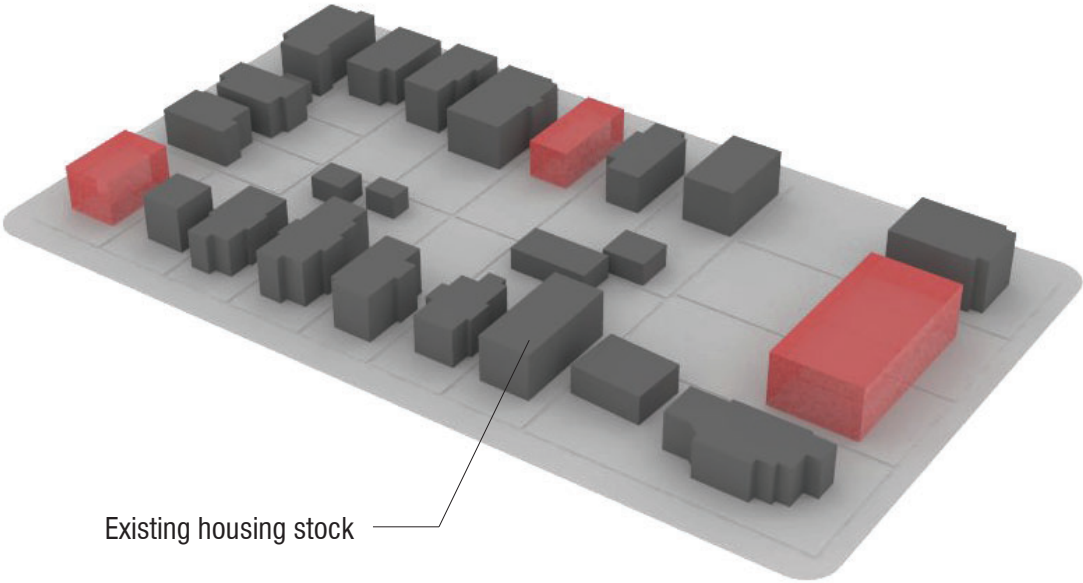
Single Elderly
Singles
Couples

| | | Selected Household Types | | | | | |
|-----------------------------|--------------|--------------------------|--------|--------------------|---------------|---------|---|
| Common Household Activities | | SINGLE ELDERLY | SINGLE | NUCLEAR / EXTENDED | SINGLE-HEADED | COUPLES | Associated Spaces |
| | Cook | × | × | × | × | × | Kitchen |
| | Eat | × | × | × | × | × | Living, Kitchen, Dining, Deck/Patio |
| | Gather | | | × | × | | Living, Dining, Kitchen, Rec./Bonus, Deck/Patio |
| | Play | | | × | × | | Living, Dining, Bedroom, Yard, Deck/Patio |
| | Read | × | × | × | × | × | Living, Study, Rec./Bonus, Bedroom |
| | Storage | × | × | × | × | × | Kitchen, Bedroom, Garage, Storage |
| | Entertain | | × | × | × | × | Living, Dining, Kitchen, Rec./Bonus, Deck/Patio |
| | Television | × | × | × | × | × | Living, Rec./Bonus, Bedroom |
| | Computer | | × | × | × | × | Living, Dining, Study, Rec./Bonus, Bedroom |
| | Child Care | | | × | × | | Living, Kitchen, Rec./Bonus, Bedroom, Bathroom |
| | Work / Study | | × | × | × | × | Living, Dining, Study, Bedroom |
| | Laundry | × | | × | × | × | Laundry, Bathroom |
| | Sleep | × | × | × | × | × | Living, Bedroom |
| | Hygiene | × | × | × | × | × | Bathroom |
| | Housework | × | × | × | × | × | Kitchen, Bathroom, Garage, Storage |
| | Yardwork | | | × | × | | Yard |
| | Pets | × | × | × | × | × | Living, Rec./Bonus, Yard, Deck/Patio |
| | Vehicles | | × | × | × | × | Garage |
| | Fitness | | × | × | × | × | Living, Rec./Bonus, Garage, Yard |

REDEVELOPMENT STRATEGIES

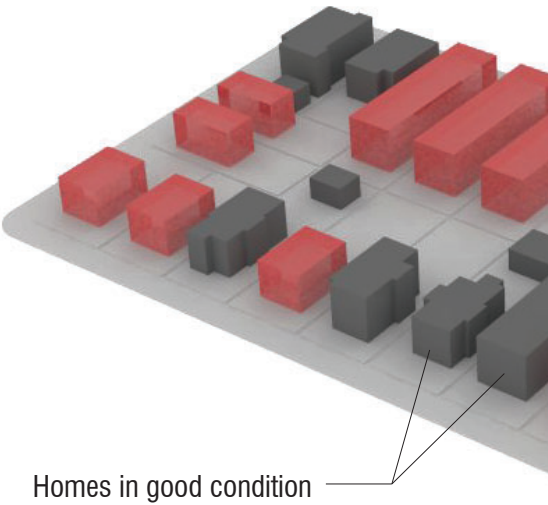
VACANCY INFILL

Insert new housing into vacant lots only.



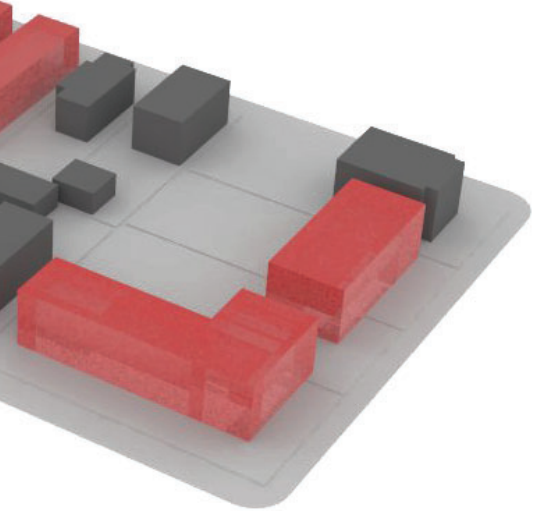
SELECTIVE D

Demolish homes in very poor condition on these lots as well



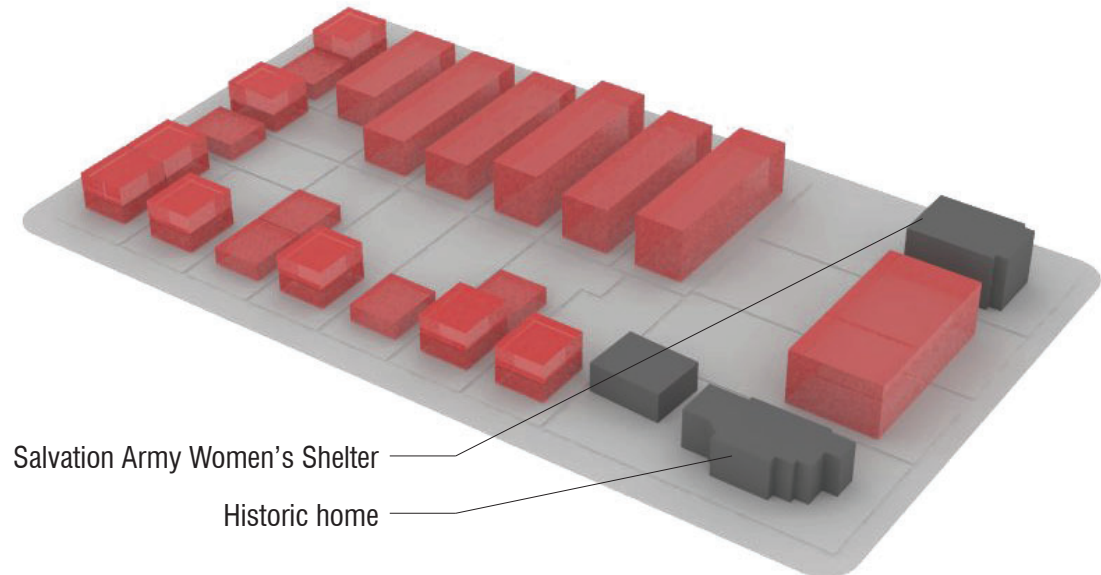
DEMOLITION

or condition. Place housing
ell as vacant lots.



COMPLETE REDEVELOPMENT

Demolish entire place except the women's shelter and
historic home at corner site. Fill lots with new types of
housing.



Salvation Army Women's Shelter

Historic home

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